

DECEMBER

N.S.E.  
25 CENTS

# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

REG. U.S. PAT. OFF.

\$10,000

IN PRIZES

PAGES 34-35 AND 891

SEE PAGE 930





---

# REACH FOR YOUR TELEPHONE AND TAKE COMMAND

---



---

You need only pick up your telephone to control millions of dollars' worth of property . . . a thousand yards or a thousand miles of wire . . . five thousand or five million dollars' worth of equipment . . . a few or many of the Bell System's hundreds of thousands of trained workers.

What you get from your telephone depends on your wish of this or any moment.

Few things you buy can so exactly fit your needs. Telephone service is made to your order for each call . . . and the telephone becomes an extension of your voice and personality for whatever purpose you choose. All of the System's plant and equipment is of interest to

you, for you cannot be sure which of the 20 million interconnecting telephones in this country you may need to reach.

The Bell System provides a constantly improving service at the least cost consistent with financial safety. This means that it pays only reasonable regular dividends and devotes all earnings beyond that to the extension and improvement of the service.

This has been the practice for half a century, with the result that the public has doubled its use of Bell telephones in the last ten years.

The money you pay to your telephone company brings you steadily increasing value.

---

★ *AMERICAN TELEPHONE AND TELEGRAPH COMPANY* ★





# Inventor Takes Light From Sky

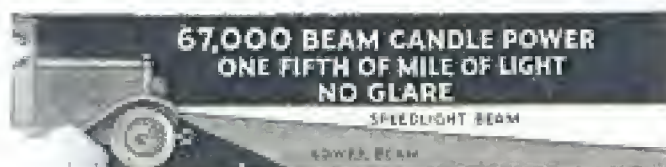


## Lights Road Ahead With 67,000 Candle Power Beam

A MAZING discovery of new automobile road light literally takes light out of the sky—imagine a light that throws a 67,000 candle power beam for over one-half of a mile—yet absolutely NO GLARE in the eyes of approaching drivers. A light that makes your road bright as day. Fast night driving now safe. This "pin-ray" road light not only cannot glare itself, but cuts through on-coming brights.

An item in the Kansas City Star says, "At a demonstration at the Kansas City Airport a newspaper was read at a distance of more than 1,000 feet in front of the light. The ground in front of the light for this distance was well illuminated but the rays were not projected higher than eighteen inches above the ground." No wonder it was awarded the grand prize and two gold medals in world competition.

## AGENTS Cleaning Huge Profits



principle in headlighting. Discovered by a famous light engineer. So judge for yourself what you can do with a light like this. Send the coupon today for our introductory offer. Speedlight Company, 1731 Belmont Ave., Dept. 10-W, Chicago, Illinois.

Agents and distributors from coast to coast are making big money equipping passenger buses, and trucks with this brand new road light. This is your opportunity to make up to \$10—\$20—\$30 a day. Some agents make even more. Kinney made \$10 in a few hours. Frost made \$150 in one day. Burroughs sold fifty lights to Richmond Fire and Police Departments. Over 20,000,000 cars need this wonderful light to protect human lives and property against dangers of blinding lights, fog, rain, and darkness.

## NOT A PAINTED BULB

But a real scientifically constructed road light with a concentrated 67,000 candle power beam of light on the road for over a thousand feet and no glare. Cuts through fog and darkness like a knife. There is no light like it in the world. It is not a spot, it embodies an absolutely new

TO GET THIS LIGHT

**FREE OF EXTRA COST**

**DON'T TURN PAGE**

**MAIL THIS COUPON FIRST**

Speedlight Company,  
1731 Belmont Avenue,  
Dept. 10-W, Chicago, Illinois.

Without obligation to me please send me full details of your offer.

**This One**

Name

Address

City



UPDU-F6Q-1RTA



When writing to advertisers please mention Popular Mechanics



# "For 16 Weeks



*I enjoyed every broadcast from*

## VK3ME

**MELBOURNE, AUSTRALIA**

*This is not a "freak" record. Hundreds of other Scott All-Wave Receivers—all summer long—have brought their owners tons of clear, perfect music and song from the other side of the world.*

**E**VERY now and then, the story of some phenomenal instance of extremely long distance radio reception breaks into the press. DX fans usually find little interest in such stories because they know the performance which they relate is invariably due to "freak" conditions.

But DX fans KNOW, when my receiver brings in every broadcast from VK3ME for 16 consecutive weeks, that full credit must go to the receiver that did the work. And when they learn that hundreds of other receivers exactly like mine, and located in all parts of the world, are piling up equally sensational records, they are well satisfied that the Scott All-Wave is not only the most powerful, most sensitive receiver possible to obtain, but the one receiver that fulfills their lifelong hopes.

### Undeniable Proof

Away last spring I made up my mind to eclipse all standards of radio reception—distance—power—selectivity and tone. I believed the Scott All-Wave would do it, so I set out to make a day-to-day log of VK3ME, Melbourne, 9360 miles away from my receiver. I tuned in every broadcast, on the loud speaker, and to prove to the entire world that I heard every VK3ME program with full volume, and with perfect tone and clarity, I made a disc recording of every broadcast! Half of these records I sent to VK3ME. The others are at my laboratory and will be played for anybody who asks to hear them.

### Not a Special Set

The Scott All-Wave Receiver that you may buy will in no way differ from the one I used in my 16-week test. It will be identical to the hundreds of other Scott All-Wave Receivers that tune in voice from England, France, Germany, Italy, Japan, Indo-China, and South America every day in the



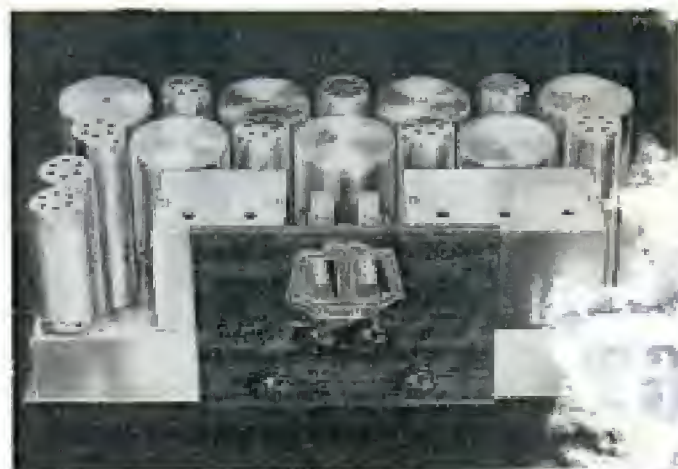
*This cablegram verifies the first 10 weeks' reception. To date there has not been time for my log of the last 6 weeks to reach Melbourne.*

**E. H. SCOTT RADIO LABORATORIES, Inc.**  
(Formerly Scott Transformer Co.)

4450 Ravenswood Ave., Dept. P-12, Chicago, Illinois

## The SCOTT ALL-WAVE

### 15-550 METER SUPERHETERODYNE



The Scott All-Wave Chromium Plated Chassis

week—summer and winter. The set that I to you will actually be tested on reception G5SW, Chelmsford, England, or 12RO, Rome, before shipping!

### Another Challenge!

Again, I challenge the whole world of radio to any kind of competitive test, between 15 and 550 meters. I guarantee that the Scott All-Wave will bring in the most stations between 550 meters—that the Scott All-Wave will leave no doubt as to superior tone and selectivity over the Broadcast Band. Clip the coupon—mail it today with your particulars. You'll be amazed to see how little it costs to own a Scott Wave Superheterodyne.

### CLIP-----

**E. H. SCOTT RADIO LABORATORIES**  
(Formerly Scott Transformer Co.)  
4450 Ravenswood Ave., Dept. P-12,  
Chicago, Ill.

Send me full particulars of the Scott All-Wave Receiver.

Name.....  
Street.....  
Town.....State.....



# Popular Mechanics Magazine

200 E. Ontario Street, Chicago, U. S. A.

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

London: Messageries Hachette,  
3 La Belle Sauvage, Ludgate Hill, E. C. 4

Paris: Hachette & Co.,  
111 Rue Reaumur

Melbourne: Gordon & Goch  
509-513 Little Collins St.

Vol. 56

December, 1931

No. 6

## Special Features

Riches from Waste.....	881
Master Model Builder Reconstructs <u>Famous Train</u> .....	<u>889</u>
Fingerprinting the Guns of Crime.....	914
Earthquakes Made to Order.....	930
Aboard the Five-Fathom Lightship.....	946
Uncle Sam's Fly-by-Nights.....	954
Mental Magic.....	963
Bird Cafeterias for Winter.....	968
The King of the Black Diamonds.....	984
<u>Seat, adjustable 922</u>	
Agricultural Implements.....	
corn picker and blower.....	893
hay dried electrically.....	978
Airplanes.....	
passengers to be carried in wing of giant "duck".....	910
plane flies on trolley wire to train station.....	887
plane mounted on a rail car imitates flight.....	963
Airships—Navy's air giant handles easily as a yacht.....	977
Antelopes—compressed air.....	924
deer escape built in flume safeguards.....	905
exercising wheel for foxes.....	992
hospitals for.....	927
Antiques—concrete on team adds life to exhibit.....	933
Army, U. S.—latest weapons for war in the air.....	944
Ash Can—under furnace pit keeps cellar clean.....	931
Astronomy—earth a speck and its speed a snail's pace.....	990
Automobiles.....	
adjustable roller for auto absorbs road shock.....	981
auto under brightest lights from start to finish.....	940
Automobiles, Accessories—motor oil is refined while wigne runs.....	<u>982</u>
Automobiles, Design—car doors operate together to prevent accidents.....	967
Automobiles, Racing.....	
auto is built to bring back speed title.....	967
grooved tires help win Pikes Peak race.....	929
three-wheeled racing cars.....	894
Automobiles, Tires—doughnut tires offer easier riding.....	961
Boats and Boating.....	
air propeller on motorboat gives high speed.....	894
indicator shows boat speed on uniform dial.....	933
towboat powered with diesel engines.....	981
Brain—model of, made of neon tubes.....	939
Chains—anchor, pulled apart to test strength.....	932
Clothing—jacket for hunters and sabermen.....	966
<u>Boat and top speed test 922</u>	
<u>Alloy, super 934</u>	
<u>Coal</u>	
sold in fancy baskets to Japanese consumers.....	989
special truck gathers coal for study.....	932
Cooker—electric stove for frankfurters.....	882
Crime.....	
war on organized gun running for killers.....	896
wire rolls to stop bandits fleeing in autos.....	976
Diving—undersea acrobats the world never views.....	974
Drain Pipes—clogged-up, cleared by flexible rod.....	933
Drill Table—and vise in one for odd-shaped work.....	885
Fire Fighting.....	
climbing ladders is training for firemen.....	973
fireman in asbestos suit walks through flames.....	978
Fires, Forest—plow fights flames by cutting trenches.....	967
Flowers—flower growth is shown by X-ray.....	936
Fruit—easily sacked with backing stand.....	972
Fuel—sawdust turned into.....	961
Gardens, Rock—miniature castle built in huge.....	884
Gold—separator requires no water.....	940
Gold—adjustable stop grips to cure troubles.....	807
Guns <u>rain 989</u>	
long-range tear-gas gun.....	945
rifle with counterbalance gives greater accuracy.....	962
Hammer—feeds itself rocks.....	933
Headstock—thousand and one purposes achieved by.....	940
Heater, Gas—push button controls water heater.....	992
Heating and Ventilating.....	
heating and cooling system combined in one unit.....	935
signal rises above radiator if humidifiers run dry.....	896
steam radiator is combined with electric heater.....	939
Hotel—world's tallest, built on stilts over railway.....	979
Household Devices.....	938
Huns—lion-proof, for visitors to South African park.....	988
Insects—ants almost human in their actions.....	941
Lighting—light paints designs with cut-out patterns.....	895
<u>Insects, poison spray 912</u>	
<u>Light paint wall decorated 895</u>	

[Continued on Page 4]

ISSUED MONTHLY

SUBSCRIPTION:

SINGLE COPY, 25 CENTS

In United States and its possessions, Cuba, Mexico, and all  
countries in the Pan-American Postal Union, per year, postpaid

\$2.50

To all other countries in the Postal Union

3.00

All subscriptions are discontinued at expiration. Please examine the date printed on your wrapper.

Entered as Second Class Matter Sept. 15, 1906, at the Post Office at Chicago, Illinois, under Act of March 2d, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

Copyright, 1931, by Popular Mechanics Co.

Copyright in Australia. Copyright in France

Clothes hanger  
and brush 924

Lemon squeezer 924  
Hay dried electrically 978

aluminum asbestos insulation 960



Muse, Viter Produces [Contents-Continued]

Locks—mine shaft elevator 923	960
key-and-code combination lock is pick-proof	885
recording lock tells time of opening	885
Locomotive—wears a bumper to beat the water	974
Machinist Shop—on auto pays cost of tooling	893
Mail—serial torpedo carries mail on overhead cable	900
Man—road man shows distances on sliding chart	976
Motorcycle	
one-man car body is built on	936
police, equipped with radio set	958
Moving Pictures	
cameras operated in water for submarine film	993
microphone like bomb makes better talkies	886
photographed on disk instead of ribbon film	957
Musical Instruments	
made out of broomstick and auto horn	957
radio and pump combined in one cabinet	885
Paints and Painting—metal colors from rocks	937
Phone Electric Cell—sorts boxes on collector belt	934
Puzzles—can you solve these?	1056
Radio	
blind short-wave operators talk around world	982
easy ways of solving your radio problems	997
Radio, Aerials—several receivers on single antenna	995
Radio, Apparatus	
meter helps amateurs check S-W bands	994
power supply for crystal-controlled oscillator	998
transmitter condensers made from battery switches	996
vernier dial from can cover	999
Radio, Loud Speaker—from headphones	994
Radio, Receivers	
adjusting screen-grid	996
little plant receiver for 2-volt tubes	1000
Radio, Reception	
filter stops power-line interference	996
shielded lead-in reduces interference	999
Radio, Repairing—audio transformers quickly repaired	995
Railroads—rail fire lighters guard property and lives	953
Roads—iron roadways resist wear of heavy traffic	972
Saws and Sawing—electric saw does many types	951
Sculpture—man's head large as a house is carved in stone	934
Ships and Shipping—ocean liners fitted with smoke deflectors	892
Snow—rain machine melts snow to clean streets	929
Sprinkler—"rain gun" waters flowers from pond or stream	989
Taxidermy—small animals are mounted to make book ends	883
Telephone—secret papers sent by radio	982
Tool—groover has electric motor with safety switch	937
Typewriter—copies made on without carbon paper	986
Umbrella—with side curtain revolves over table	982
Windmill—made of old scrap iron for a garden	945

AMATEUR MECHANICS

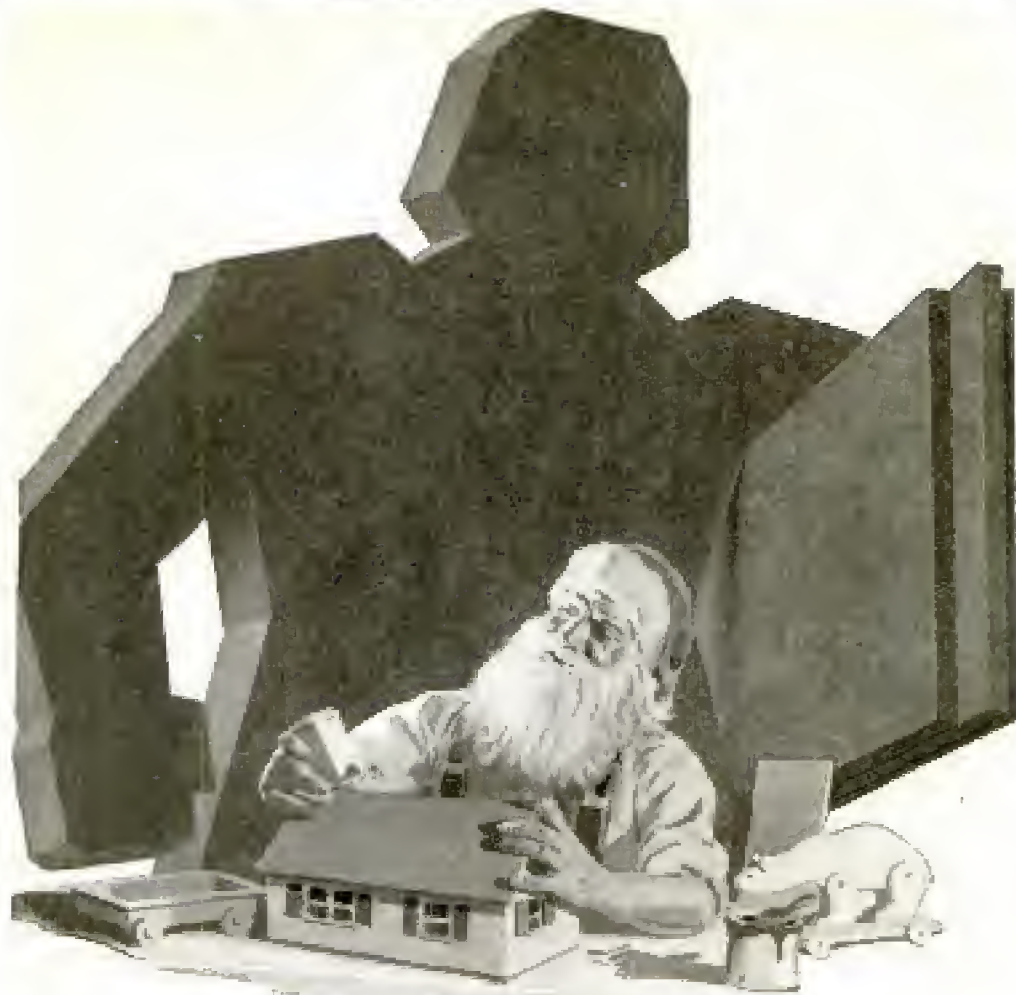
Airplanes, Model—power for small paper glider	1005
Automobiles, Accessories—copper strips add to efficiency of car heaters	1013
Automobiles, Lighting—stop and go lights are automatic	1007
Automobiles, Truck—getting out of mud without strain on rear springs	1005
Batteries—height of electrolyte tested by glass tube	1006
Beds—sponge rubber prevents vibration from heavy traffic	1015
Blowtorch—lamp improvised from	1035
Books—metal covers for	1005
Candles—"teeter-totter" for parties	1007
Cistern—filter for	1015
Clothesline—brake lever used to tighten	1025
Clothing—chamois-skin lining protects watch pocket	1013
Conservatory—in the dining-room window	1020
Crib—rolling, teaches baby to walk	1030
Crocks—handles on large earthenware	1035
Display Cards—suction cup holds window cards	1008
Dogs—adjustable harness fits the growing puppy	1005
Door Hook—tape prevents fingers adhering to cold	1029
Doors—how to adjust the lock strike of sagging	1012
Doors, Storm—spring check for, prevents broken glass	1034
Drilling—sawing metal by	1029
Engines—mirror for checking timing	1020
Fence Posts—from old auto frames	1035
Fireplace—a crane for your	1013
Furnace—extension light aids in cleaning inside of	1020

Garage—sure-hold door fastener	1030
Gloves—rubber-tipped, help the postman	1021
Iceboat—speedy, seats four	1016
Ladder—shoulder pad for carrying	1033
Lathe—how to make your own pulleys and lineshaft bearings	1014
Mirrors—a Sheraton mirror you can build	1009
Models—simplified ship-in-a-bottle	1031
Moving Pictures	
camera tricks for the home movie maker	1022
home-movie screen from aluminum baking pan	1024
Musical Instruments—sounding board improves tone and volume of harmonica	1030
Pen—thumbtack on cork forms "primer"	1021
Photography	
"midger" tanks will save developer	1013
ruled holder for exposing prints	1014
trick photos resemble double exposures	1012
Picture Frames—from film racks	1021
Pictures—copying by reflection	1008
Pipes, Water—thawing out	1036
Poultry—improved heater for water fountain	1013
Saws and Sawing—carpenters' sawhorse has box for holding tools	1024
Show Cards—method of cutting to prevent waste	1029
Signs—inflated by electric fan	1029
Smokers' Accessories—ash catcher fits cigaret holder	1006
Snow Sweeper—homemade, motor-driven	1022
Stairs—aid in washing walls	1025
Stools—kitchen stool quickly cut on your bandsaw	1034
Stoves, Gas—safety shield over gas cocks	1008
Tie Rack—holds ties separate	1032
Toys	
centrifugal toys that amuse	1001
rack and hangers for doll clothes	1015
toy track made of sheet metal	1025
Typewriter—typewriting art	1023
Vegetables—sprouted in cellar	1011
Wallpaper—the beauty of, and how to apply it	1026
Wash Basket—cloth lining for	1033
Water Valves—locks for	1022
Window Frames—wooden holder simplifies planing of	1035
Windows—repair for broken glass	1007
Wood Box—window seat, operated by windlass	1036

SHOP NOTES

Armature Growler—works on a 32-volt circuit	1052
Automobiles, Repairing—damage to axle shaft prevented by reversing nut	1053
Automobiles, Tires—wooden mallet holds inner tube for buffing	1047
Automobiles, Truck—portable tail light and flag for overhanging loads	1046
Camera—mirror adds reflecting feature to	1041
Drilling—adjustable countersink clamps to drill bit	1055
Drill Press	
screwdriver driven by	1046
sensitive, for small work	1037
Drills—how to grind to prevent burrs	1045
Fireplace—construction for the small home	1048
Forge—vacuum cleaner provides blower for	1039
Gates—latch for wire farm	1047
Grinding—using abrasives in the small shop	1043
Horse, Metal—equipped with roller supports long work	1055
Iron, Bent— jig for forming scrolls	1054
Lathe	
boring tool improvised from pipe tee	1040
tooling for duratium	1042
Metals	
preventing cracks when flanging	1042
this tool puts a decorative finish on aluminum	1047
Pipes, Water—preventing freezing of	1040
Punch—center punching at equal intervals	1042
Roofing—removing corrugated, without damage	1053
Safety Devices and Measures—mirrors on safety signal reduce accidents at "blind" corners	1054
Saws and Sawing	
cure for saw-filing squeaks	1040
cut sheet metal on the home bandsaw	1052
Scaffolding—old ice tanks used for	1042
Shaw—guard prevents cutting fingers on	1041
Signs—heat fasteners from gummed naper and pins	1042
Vise	
compression spring holds handle in position	1051
swivel joint increases usefulness of stationary	1041
Wire—tool for flattening	1053





## PRESDWOOD works with Santa Claus

Countless homes will be brightened this Christmas with gifts that Masonite Presdwood helped make . . . beautiful, durable gifts that come from factories all over the world.

The makers of these articles are Presdwood enthusiasts. Naturally! Presdwood is bettering their products, cutting their costs, speeding up their production.

The men at your presses, planers, drills and saws will take kindly to these modern industrial boards. So will the machines themselves — and the men who work with hand tools. You'll have little concern over waste and rejections,

for Presdwood is rigidly graded at the mill.

Get acquainted with Presdwood, the smooth, grainless, water-resisting board that doesn't crack, chip, split, splinter or warp. Use it in your factory. The free Presdwood booklet will give you the complete story. Write for your copy today, or consult your lumber dealer.

**Masonite**  
**PRESDWOOD**  
STRUCTURAL INSULATION • INSULATING BATH  
QUARTERBOARD • Laminated FLOORING

"Made in Mississippi"

### Masonite *Cushioned* FLOORING OF TEMPERED PRESDWOOD

This new, all-wood flooring with the in-built shock absorber offers tremendous advantages in beauty, durability and convenience. Outer layers of Tempered Presdwood assure beauty and long life. Inner layer of Quarterboard provides resiliency, insulation and sound absorption. Tongue-and-groove construction makes perfect, interlocking joints. Two-color reversible squares and borders make possible endless variety of design. Send for booklet describing this modern flooring.

MASONITE CORPORATION, Dept. L-12 ©M.C., 1931  
111 W. Washington Street, Chicago, Ill.  
Please send your free illustrated booklet that describes  
Masonite Presdwood and its many uses.

Name

Street

City  State

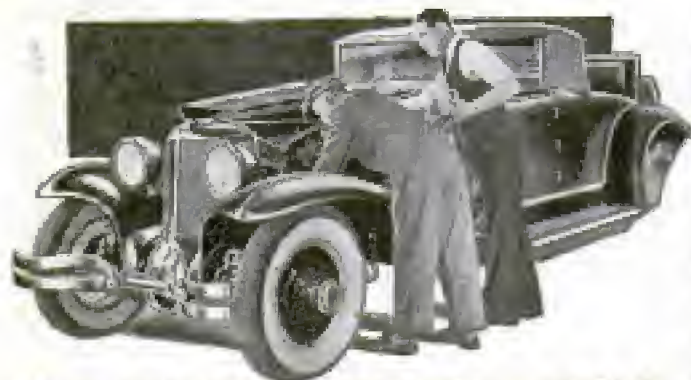
☐ If interested in Cushioned Flooring, check here.

When writing to advertisers please mention *Popular Mechanics*

*Model Railway 9/8*



# Auto Service Men and Auto Dealers! Here's a new Opportunity!



## M. I. A. "JOB-WAY" TRAINING Is the Only Answer

M. I. A. Training has been successful for over ten years. Through this Training—complete, practical, up-to-date—thousands of men have become Expert Auto Service Men—making good money, holding good jobs. When you enroll for this training, you do not have to leave your job or your home. Your training is brought right to you—on the job, and in your home. You earn while you learn and you give up no time from income producing hours. And "Job-Way" training sticks. It never gets away. Every M. I. A. Trained Service man can do two to three times the number of jobs per day that the ordinary "mechanic" can do. And he does them correctly—every time!

### Low Cost—Start Now

The Cost of M. I. A. "Job-Way" training is very low. A small deposit—so little the student never misses it—will start him. The payments are easy. Anyone can make them without struggling. Get started, now.

## FACTS FREE

Simply clip the coupon. It will bring all the details—complete information on M. I. A. Training; exactly what it is—how it is studied—how it is applied—why every man who completes it, never has to worry about his income and his progress—and why every dealer who urges his service men to enroll for M. I. A. training speeds up his business to an almost unbelievable degree. Clip the coupon. Mail it now.

**Motor Institute of America**  
Motor Institute Building  
Dept. 4169 Evanston, Ill.

When writing to advertisers please mention Popular Mechanics

## Good Pay for Service Men—and more Profit for Auto Dealers Who Meet the New Situation In the RIGHT WAY!

The auto business has changed. Now Motor Cars and Trucks are finely engineered pieces of machinery—designed and built to meet a demand for performance unthought of 10 years ago. And the service requirements of these cars are just as different as the service needs of 10 years ago. A new type of dealer service is demanded. A new type of service man is needed. The Dealer, and the service man who recognizes the difference between yesterday and today in the auto business, has an immediate, golden future ahead of him.

### The New DEALER SERVICE

The car dealer, regardless of what car he sells, must be able to give expert service on all makes of cars. His shop must be so manned that any repair job on any car can be done just as the factory would do that job. The dealer who offers such service will make service profits and car SALES that will exceed even his greatest ambitions.

### The New SERVICE MAN

Today, and in the future, the Service Man can't be just a "mechanic"—just a "fixer." He must understand automobiles; be able to repair or adjust all service troubles, quickly and efficiently. He must work with his head more than with his hands. Such service men get paid for what they know, even more than for what they do. They're invaluable. They never have to look for work. Jobs seek them. They get big pay, and hold the better jobs.



**CLIP  
COUPON  
TODAY**

Motor Institute of America, Dept. 4169,  
Motor Institute Building, Evanston, Ill.  
Send me all the facts on M. I. A. training.  
☐ (If you are a dealer or shop owner, check here.)

Name.....

Street.....

Town..... State.....

Age..... Position.....



# Now the LaSalle Problem Method Increases Your Salary



—Why in six months' time alone as many as 1,248 LaSalle members reported definite salary-increases totalling \$1,399,507, an average increase per man of 89 per cent!



No matter what you are making now, you are interested in any plan which suggests a practical way to increase your earnings—within a comparatively short time. There is such a plan—it is known as the LaSalle Problem Method—and its practical value is attested by thousands of men who have employed it to plus their native aptitude with systematic training. Read these typical experiences:

**Boosts Earnings More Than 500 Per Cent**—"In 1920, I was employed in a local railroad office, and was earning only a living wage—I am now traffic manager of the King Company, the largest exclusive iron lamp post manufacturers in the United States. It got in the world. . . . My training in Traffic Management with LaSalle is responsible for this advancement and the increase of more than 500 per cent in my earnings."

JOHN R. MEERS, Sheffield, Ala.

**Becomes Treasurer of Big Department Store**—"My salary is now 300 per cent larger than it was when I saw the sign which led me to your school—and I am now Treasurer of the Palais Royal. I will be eternally grateful to you for my advancement and I recommend your training to every ambitious young man, for a \$5,000 position is waiting for anyone who will take your training and apply himself."

W. F. HISEY, Washington, D. C.

**Shop Laborer Becomes Lawyer**—"When I enrolled in LaSalle Law training, I was a laborer in a shop. I worked all day in the shop and studied until late each night. I was soon promoted to the shopkeeper's office and then to accountant. In three years, I passed the Bar examination and a little later, I began the practice of law."

JOHN S. GIBSON, Douglas, Ga.

**Stenographer Promoted to Comptroller**—"LaSalle training in accountancy has been an important factor in my advancement from stenographer to comptroller of the Rauter National Park Company."

F. R. GRIFFITHS, Tacoma, Wash.

When thousands of men in the United States and Canada (not to mention many hundreds in England, Australia, China and other foreign countries) choose the LaSalle Problem Method to speed their career—when over 4,000 LaSalle members belong to the LaSalle One Hundred Cent Club, having more than doubled their incomes—when the average increase reported by other thousands is 89 per cent—surely the LaSalle Problem Method must offer an unusually sound way of securing quickly the kind of experience that can be asked. It does. And here are very good reasons why:



## You Learn by Doing

Suppose it were your privilege every day to sit in conference with the head of your firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to work those problems out—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster—by far—than that of the man who is compelled to pick up experience hit-or-miss.

## LaSalle Extension University

THE WORLD'S LARGEST BUSINESS TRAINING INSTITUTION

Find Yourself Through LaSalle!  
LaSalle Extension University, Dept. 1264-R, Chicago

I would welcome an outline of the LaSalle plan, together with a copy of "Ten Years' Promotion in One," all without obligation.

- |   |  |
|---|--|
| <input type="checkbox"/> Business Management: Managerial, Sales and Executive positions.                              | <input type="checkbox"/> Law: LL.B. Degree     |
| <input type="checkbox"/> Higher Accountancy: Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc. | <input type="checkbox"/> Industrial Management |
| <input type="checkbox"/> Expert Bookkeeping   | <input type="checkbox"/> Modern Foremanship    |
| <input type="checkbox"/> C. P. A. Coaching  | <input type="checkbox"/> Personnel Management  |
| <input type="checkbox"/> Paper Salesman's Training  | <input type="checkbox"/> Banking and Finance   |
| <input type="checkbox"/> Traffic Management—Foreign and Domestic  | <input type="checkbox"/> Credit and Collection |
| <input type="checkbox"/> Railway Station Management   | <input type="checkbox"/> Correspondence        |
| <input type="checkbox"/> Business Correspondence  | <input type="checkbox"/> Telegraphy            |
| <input type="checkbox"/> Railway Accounting   | <input type="checkbox"/> Business English      |
| <input type="checkbox"/> Commercial Law   | <input type="checkbox"/> Effective Speaking    |
| <input type="checkbox"/> Commercial Spelling  |  |



mail coupon now

Name \_\_\_\_\_ Present Position \_\_\_\_\_ Address \_\_\_\_\_

When writing to advertisers please mention Popular Mechanics



# AVIATION Has a Good Pay Job for YOU!



C. L. Currier



L. B. Scholtz



C. W. Goodman  
**\$400 Per Month**  
"My first job paid \$300 per month. Now I earn \$400. The most important requirement in Aviation is training such as yours."  
—C. L. Currier.

**Job in 4 Days**  
"I came from South Africa to learn Aviation at Lincoln. Four days after enrolling, I secured a good position in a Lincoln aircraft factory."—L. B. Scholtz.

**Airport Manager**  
"I am now manager of Lindbergh Field, Lincoln, Neb., at a substantial salary. I attribute my success solely to the Lincoln School."—C. W. Goodman.

## Guarantee Yourself One of the Best Positions By Training at the Lincoln School

Take advantage of the greatest opportunity ever offered young men! GET INTO AVIATION! Other industries are laying off men and reducing pay. But Aviation has many **GOOD PAY jobs** and needs better-trained men to fill them!

That's because Aviation is the world's fastest growing industry. Because—while older industries and professions are crowded—in Aviation new positions open every day.

But don't think you can get a Big Pay Aviation job by magic! **First you must have proper training!**

**Come to Lincoln**—Lincoln students get the most complete, thorough, practical civilian Aviation training in the United States. Lincoln graduates get the most responsible, best paying Mechanic and Pilot positions!

### FREE Aerial Radio Courses

Our new Special Course in Aerial Radio includes tuition and will be given **FREE** to students who enroll for one of our other regular courses within the next 90 days!

**Extraordinary Facilities**—Lincoln's facilities are so extensive that you are assured of intensive training. \$250,000 worth of buildings and equipment. A \$100,000 airport with all-weather runways, and lighted for night flying. A large fleet including 4 distinct types of government-licensed planes. Seasoned, government-licensed instructors, who take a personal interest in every student.

Lincoln's \$250,000 Mechanic's School (right). A view at the \$100,000, modern Airport (below).



WE  
ALSO  
TEACH  
IN  
SPANISH



**Part Time Employment** is offered students to help pay cost of room and board while attending school. We also help our graduates locate Good Pay positions.

**12 Years' Experience** Training aviation students—10 years longer than most schools—has enabled us to develop an unsurpassed, thorough, practical training system.

# LINCOLN

## AIRPLANE AND FLYING SCHOOL

Government-Approved — Highest Rating — Equipment and Instruction are superior to government requirements

### LEARN AVIATION AT LINCOLN...WHERE LINDBERGH LEARNED

When writing to advertisers please mention Popular Mechanics

A **Mechanics' School** connected with a **large airplane factory**—ensuring instruction according to actual factory standards.

**Mechanics Wanted Now**—Properly trained mechanics are wanted every day. Lincoln graduates—because of their complete, practical training—are getting the best of these positions right along.

At Lincoln you get practical training on real ships. You learn to build and repair every part of a plane—to overhaul important types of engines. You learn about instruments, electrical equipment, aerial radio, parachute rigging, etc.

**Pilots Wanted Also** at Good Pay. We train you for best Pilot positions. Qualify you for Dept. of Commerce pilot license tests.

**Ground and Flying School** hold highest government approval. Operated under regular supervision of U. S. Dept. of Commerce.

### World's Best Known School

Lincoln is the best known Aviation school in the world. Students come here from many foreign countries. We have enrolled men from China, South Africa, Scotland, Alaska, Canada, South America, as well as from practically every state in the United States.

### Catalog on Request

Contains complete information about Lincoln School. Lists reasonable tuition costs. Gives details of part time employment offer to help students pay room and board while in training. Mail coupon today!



### MAIL THIS COUPON!

**LINCOLN AIRPLANE & FLYING SCHOOL**  
205A Aircraft Building, Lincoln, Nebr.

Gentlemen: Please send me your Catalog, "Aviation Beckons You" containing full information about the Lincoln School and reasonable tuition.

I am interested in:

☐ Flying Course ☐ Welding Course  
☐ Mechanic Course ☐ Radio Course

Name.....Age.....

Address.....

City.....State.....



# "SUCCESS



"If my own I. C. S. experience suggests a way to others, the reward will be a sincere satisfaction."

*L. Berg*

## lies in a man himself"

THE BUSINESS LEADERS OF TODAY ARE THE  
I. C. S. STUDENTS OF YESTERDAY

"Many men clever with their hands wonder why they do not get on better in the world. If they would realize the value of training the mind to direct the handy fingers, their problems would be solved."

"Success lies in a man himself. Satisfaction with one's present attainment is man's deadliest enemy in this modern age."

Louis B. Berg, Works Manager of the AC Spark Plug Company, a division of General Motors, is speaking.

Back in 1909 Mr. Berg enrolled for a course in Mechanical Drawing with the International Correspondence Schools. Later he studied I. C. S. Mechanical Engineering.

When he was 14 years old, Mr. Berg was core-making in a foundry. At 18 he was a machinist's apprentice in a railroad shop, and at 20 he was in the automobile accessory business. All the time he was learning the job at hand, and, by spare-time study, preparing himself for the bigger jobs ahead! One continuous series of promotions followed. He became associated with "AC" in 1917.

Any ambitious man can learn the secret of advancement . . . learn how to make more money! *The real secret of success lies in you! The I. C. S. students of today will be the business leaders of tomorrow!*

### INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University"

BOX 5573-G, SCRANTON, PENNA.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X:

#### TECHNICAL AND INDUSTRIAL COURSES

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> Architect                                    | <input type="checkbox"/> Patternmaker                                  | <input type="checkbox"/> R. R. Locomotives                               |
| <input type="checkbox"/> Architectural Draftsman                      | <input type="checkbox"/> Pipefitter <input type="checkbox"/> Tin-Smith | <input type="checkbox"/> R. R. Section Foreman                           |
| <input type="checkbox"/> Building Estimating                          | <input type="checkbox"/> Bridge Engineer                               | <input type="checkbox"/> Highway Engineering                             |
| <input type="checkbox"/> Wood Millwork                                | <input type="checkbox"/> Bridge and Building Foreman                   | <input type="checkbox"/> R. R. Bridge and Building Foreman               |
| <input type="checkbox"/> Contractor and Builder                       | <input type="checkbox"/> Gas Engines                                   | <input type="checkbox"/> Air Brakes                                      |
| <input type="checkbox"/> Structural Draftsman                         | <input type="checkbox"/> Diesel Engines                                | <input type="checkbox"/> Train Operation                                 |
| <input type="checkbox"/> Structural Engineer                          | <input type="checkbox"/> Aviation Engines                              | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy     |
| <input type="checkbox"/> Electric Wiring                              | <input type="checkbox"/> Automobile Mechanic                           | <input type="checkbox"/> Coal Mining Engineer                            |
| <input type="checkbox"/> Electrical Engineer                          | <input type="checkbox"/> Plumbing                                      | <input type="checkbox"/> Navigation <input type="checkbox"/> Boilermaker |
| <input type="checkbox"/> Electric Lighting                            | <input type="checkbox"/> Steam Fitting                                 | <input type="checkbox"/> Textile Overseer or Supt.                       |
| <input type="checkbox"/> Welding, Electric and Gas                    | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation  | <input type="checkbox"/> Cotton Manufacturing                            |
| <input type="checkbox"/> Handling Shop Blueprints                     | <input type="checkbox"/> Sheet Metal Worker                            | <input type="checkbox"/> Wooden Manufacturing                            |
| <input type="checkbox"/> Telegraph Engineer                           | <input type="checkbox"/> Steam Engineer                                | <input type="checkbox"/> Agriculture                                     |
| <input type="checkbox"/> Telephone Work                               | <input type="checkbox"/> Steam Electric Engineer                       | <input type="checkbox"/> Fruit Growing                                   |
| <input type="checkbox"/> Mechanical Engineer                          | <input type="checkbox"/> Civil Engineer                                | <input type="checkbox"/> Poultry Farming                                 |
| <input type="checkbox"/> Mechanical Draftsman                         | <input type="checkbox"/> Surveying and Mapping                         | <input type="checkbox"/> Radio <input type="checkbox"/> Marine Engineer  |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker | <input type="checkbox"/> Refrigeration                                 |  |

#### BUSINESS TRAINING COURSES

- |  |  |   |
|--|--|---|
| <input type="checkbox"/> Business Management   | <input type="checkbox"/> Secretarial Work        | <input type="checkbox"/> Complete Commercial                              |
| <input type="checkbox"/> Office Management     | <input type="checkbox"/> Spanish                 | <input type="checkbox"/> Civil Service                                    |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> French                  | <input type="checkbox"/> Mail Carrier                                     |
| <input type="checkbox"/> Personnel Management  | <input type="checkbox"/> Salesmanship            | <input type="checkbox"/> Railway Mail Clerk                               |
| <input type="checkbox"/> Traffic Management    | <input type="checkbox"/> Advertising             | <input type="checkbox"/> Grade School Subjects                            |
| <input type="checkbox"/> Accounting            | <input type="checkbox"/> Business Correspondence | <input type="checkbox"/> High School Subjects                             |
| <input type="checkbox"/> Cost Accountant       | <input type="checkbox"/> Lettering Show Cards    | <input type="checkbox"/> College Preparatory                              |
| <input type="checkbox"/> C. P. Accountant      | <input type="checkbox"/> Signs                   | <input type="checkbox"/> Illustrating <input type="checkbox"/> Cartooning |
| <input type="checkbox"/> Bookkeeping           | <input type="checkbox"/> Stenography and Typing  | <input type="checkbox"/> Lumber Dealer                                    |

Name..... Age..... Address.....

City..... State..... Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada



When writing to advertisers please mention Popular Mechanics





Here is Edwin McTeer (address on request) and some of his work. The crude pen drawing was made before he had any training and the striking story illustration (worth \$100) was made after he took the Federal Home Study Course.

## He did it— Why don't you?

Edwin McTeer is only one of the hundreds of young men (and young women, too) who are succeeding in commercial art with the help of the practical training offered by the Federal Home Study Course. Well trained artists earn \$50, \$75, \$100, \$150 a week and more.

### Success In Commercial Art

begins with a liking for drawing and the ambition to follow through with the right training. Mr. McTeer was thirty years old when he clipped a coupon like the one at the bottom of this ad, and took up the Federal Course. He progressed rapidly, increasing his earnings each year until at the end of five years he was making around \$10,000 a year. Read what he wrote us:

"I was not very talented when I entered this training with you people as you certainly know, and I had not even had high school training and I know any one with a love for the work can accomplish even more than I if they will just let you people, the Federal Schools, help them."

"I suppose you remember I opened my own independent commercial art studio, and to make a long story short, my earnings are now at the rate of over \$10,000.00 a year."

### Send For "Your Future"

If you like to draw—send for book "Your Future" and find out what amazing progress you can make with the right art training. Use the coupon now, giving age and occupation.

**Federal School**  
of Commercial Designing

1211-A Federal Schools Bldg.,  
Minneapolis, Minnesota.

Please send me "Your Future,"

Name.....

Age..... Present Occupation.....

Address.....

When writing please mention Popular Mechanics

## Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

### Play in Half Hour

After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

### Easy Lessons

Even if you don't know one note from another, the 32 printed lessons and clear pictures make it easy to learn quickly. Pay as you play.

**GIVEN** when you enroll  
—a sweet toned

**HAWAIIAN GUITAR, Carrying Case and**

**Playing Outfit—**  
Value \$15 to \$25  
No extra-charge included

OTHER COURSES: Tenor Banjo, Violin, Tuba, Tenor Guitar, Ukulele, Banjo Ukulele. Order well known instructors.

**FIRST HAWAIIAN CONSERVATORY OF MUSIC, Inc.**  
8th Floor, Woolworth Bldg., Dept. 348 New York, N. Y.

Approved as a Correspondence School Under the Laws of the State of New York—Member National Home Study Council

**FREE  
BARGAIN BOOKS**  
CATALOG OF BOOKS

Our 37th Annual 352 Page Bargain Catalog of Books of all Publishers covering all classes of Literature, Fiction, Juvenile, History, etc. Illustrated, Indexed. Lists over 25,000 titles. Used by schools, colleges, libraries and thousands of individual customers. Write today for our new 1932 catalog, "Bargains in Books."

**THE BOOK SUPPLY COMPANY, Dept. 82**  
364-366 West Monroe St., Chicago, Illinois



## VOICE

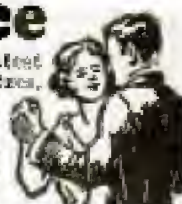
### 100% Improvement Guaranteed

We build, strengthen the vocal organs—not with singing lessons—but by fundamentally sound and scientifically correct silent exercises... and absolutely guaranteed to improve any singing or speaking voice or least 100%... Want for wonderful voice book—sent free, learn WHY you can give back the voice you want. No fees, two sent to anyone under 37 years unless stated by parent.

**PERFECT VOICE INSTITUTE, Studio 13-59**  
308 No. Michigan Ave., Chicago

## Learn to Dance

You can learn all the modern dances—the latest Tango steps, the new Fox Trots, dreamy Waltzes, smart Collegiate Steps, and popular Society Steps at home, easily and quickly. New chart method makes dancing as simple as A-B-C. No music or partner required. Don't be a wallflower. Learn to dance. Complete course—245 pages, 48 illustrations, sent on 3 Days Free Trial. Equals \$20.00 course. Send no money. Pay postman only \$1.25, plus postage upon arrival. Money back if not delighted. Catalog Free.



Franklin Pub. Co., 800 No. Clark St., Dept. 9436, Chicago

## Don't Envy The Plumber—BE ONE!

\$11.00—\$16.00 PER DAY and work EVERY day, is the Plumber's wage.

**LEARN IN 8 to 12 WEEKS** without previous experience.

If you are making less than \$50.00 a week you owe it to yourself to investigate. Get FREE catalog that tells in pictures and words how we teach this trade. Special rates now.

**UNIVERSAL PLUMBING SCHOOL, 2030 Trent Avenue, KANSAS CITY, MO.**

## WHY STAMMER?

Don't be a failure. Master perfect speech. Live healthily, comfortably and happy life. Send for free book which tells you how.

**THE LEWIS INSTITUTE, 12972 Woodward Ave., Detroit, Mich.**

## Make PHOTOGRAPHY

**YOUR CAREER**

This two billion dollar industry offers splendid opportunities as  
• Motion Picture Camera and Projection  
• "STUB" Photographer and Photo Finisher  
• and many other lines.

Learn to learn by our simplified method.

**SEND FOR FREE BOOK** giving full details. State which interests you.

**NEW YORK INSTITUTE OF PHOTOGRAPHY, 14 West 28th St. (Dept. 85) New York.**



# Get Into One Of These BIG PAY FIELDS



*All practical work on real  
Electrical machinery*

## Amazingly Easy Way to Get Into ELECTRICITY

Dissatisfied with your job? Not making enough money? Then let me show you an easy way to get into **ELECTRICITY**, where thousands of Trained Men are drawing down Big Pay envelopes every week. Coyne has been training men for the Electrical Industry since 1899. 12 weeks training here in my shops will give you the start you need.

### PRACTICAL WORK IN THE GREAT COYNE SHOPS

Come to Coyne in Chicago and learn one of these two great Trades the **QUICK** and **PRACTICAL** way—**BY ACTUAL WORK ON ACTUAL EQUIPMENT**. In the Electrical School you are trained on huge motors, generators, switchboards, auto and airplane engines, etc. No useless theory! Remember, the average time to complete the Electrical

### FREE EMPLOYMENT SERVICE TO STUDENTS

Course is only 12 weeks and in the Radio Course the average time is 10 weeks. Here we have complete Radio, Broadcasting, Television and Sound Reproduction equipment. Everything that is necessary to make your training **complete, practical and resultful**. And, you need no advanced education or previous experience at Coyne.

### MAIL ONLY THIS COUPON FOR FREE ELECTRICAL BOOK

**H. C. LEWIS, President**  
**COYNE ELECTRICAL SCHOOL, Dept. 91-73**  
500 S. Paulina Street, Chicago Illinois

Gentlemen: Please send me your big Free Electrical Book, with 151 illustrations. This does not obligate me in any way.

Name.....

Address.....

City..... State.....



*Student working on Television  
transmitter in  
Coyne Radio Shops*

## Learn **RADIO** **TELEVISION** **TALKING PICTURES**

Prepare for jobs in Service Work, Broadcasting, Talking Pictures, Wireless Operating, etc. Get in on the ground-floor of Television! Radio has grown in a few years from a mere experiment to a **BILLION DOLLAR** industry. Scores of jobs are open to the Trained Man. Prepare for them now by 10 weeks of actual shop work at Coyne!

cal Course is only 12 weeks and in the Radio Course the average time is 10 weeks. Here we have complete Radio, Broadcasting, Television and Sound Reproduction equipment. Everything that is necessary to make your training **complete, practical and resultful**. And, you need no advanced education or previous experience at Coyne.

students pay a large part of their living expenses that way. But get all the facts! Select the field you like best and mail one of the two coupons below. Let me send you either my Big Free Electrical Book or my Big Free Radio and Television Book. Mail only one coupon, but be sure to mail it at once!

### MAIL ONLY THIS COUPON FOR FREE RADIO BOOK

**H. C. LEWIS, President**  
**RADIO DIVISION, COYNE ELECTRICAL SCHOOL**  
500 S. Paulina St., Dept. 91-3H, Chicago, Ill.

Gentlemen: Send me your Big Free Radio, Television and Talking Picture Book. This does not obligate me in any way.

Name.....

Address.....

City..... State.....

When writing to advertisers please mention Popular Mechanics





## Says Good-bye to \$200 a Month Now He Earns Better Than \$10,000 a Year

At 45, C. J. Farris, of Memphis, Tenn., was earning \$200 a month as Credit Manager.

"For years," he writes, "I did general accounting work for a large corporation, doing the physical work without an understanding of the underlying principles, which caused me untold worry and a constant unsatisfied position in connection with my service."

"Finally, as a way out, I enrolled for LaSalle home-study training in Higher Accountancy, and with the daily study of principles, and the solving of practical problems in Higher Accountancy under specialized instruction, came a rapid broadening of ability—a new self-confidence that put to rout the elements of fear and indecision."

And how quickly his income mounted!

Within a year came a "raise" to \$3,000—one year later, a more responsible position commanding \$5,000 salary—then, with the winning of his degree as Certified Public Accountant, his entrance into a highly profitable profession, and the building of his own highly successful accounting firm.

### Send for Free Book—

#### "Accountancy, the Profession that Pays"

"I wish I could cry from a mountain top to young men everywhere. Educate yourself—prepare—qualify—for to increase your opportunity may come."

So writes Mr. Farris—and well he may, for right in his own experience he has proved the tremendous power of home-study training as an aid to progress.

Are you ambitious to make a real success in business—to fit yourself for positions paying \$3,000, \$5,000, \$10,000 a year, and even better? You do not need a knowledge of book-keeping to make your start. LaSalle trains you from the ground up, according to your individual needs. Low cost; easy terms.

If you are dissatisfied with your present equipment, you will find LaSalle's 64-page book, "Accountancy, the Profession that Pays," of the greatest help and inspiration—and—LaSalle will send it to you FREE. For the sake of a brighter future, clip and mail the coupon NOW.

— Find Yourself Through LaSalle! —

### LaSalle Extension University

The World's Largest Business  
Training Institution

Dept. 1264-HR Chicago

I should be glad to have details of your salary-increasing plan as applied to my advancement in the business field checked below. Also a copy of "Ten Years' Promotion in One," all without obligation.

#### Higher Accountancy

- |   |   |
|---|---|
| <input type="checkbox"/> Business Management                  | <input type="checkbox"/> Modern Business Correspondence |
| <input type="checkbox"/> Modern Salesmanship                  | <input type="checkbox"/> Modern Foremanship             |
| <input type="checkbox"/> Traffic Management                   | <input type="checkbox"/> Expert Bookkeeping             |
| <input type="checkbox"/> Railway Station Agent                | <input type="checkbox"/> C. P. A. Conching              |
| <input type="checkbox"/> Railway Accounting                   | <input type="checkbox"/> Business English               |
| <input type="checkbox"/> Law—Degree of LL.B.                  | <input type="checkbox"/> Commercial Spanish             |
| <input type="checkbox"/> Commercial Law                       | <input type="checkbox"/> Effective Speaking             |
| <input type="checkbox"/> Industrial Management                | <input type="checkbox"/> Stenotypy—Stenography          |
| <input type="checkbox"/> Banking and Finance                  | <input type="checkbox"/> Telegraphy                     |
| <input type="checkbox"/> Personnel Management                 |   |
| <input type="checkbox"/> Credit and Collection Correspondence |   |

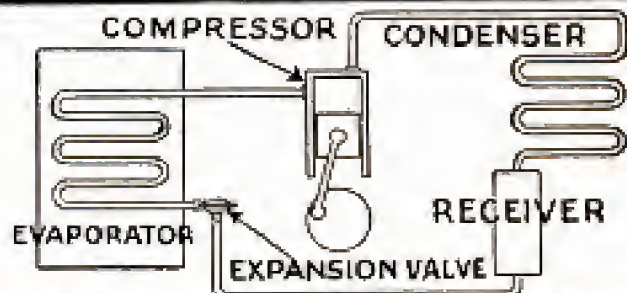
Name .....

Present Position .....

Address .....

When writing please mention Popular Mechanics

## NEW INDUSTRY NEEDS MEN



### ELECTRIC REFRIGERATION Calls You!

Newest American Industry needs men for \$200 to \$1,000 a month jobs in production service, installation and sales. Fastest growing, money-making field—backed by General Motors, General Electric, etc. New pay raise training qualifies you for big pay job. This training is done by Servel, Refrigerator, Copeland and other large manufacturers.

#### Get Valuable New Book—FREE

Our new illustrated book—Rich Rewards in Electric Refrigeration—just off the press, reveals winning plan to ambitious men. Sent absolutely free, without obligation. Be the first in your locality to get into this new money industry. Write today!



#### UTILITIES ENGINEERING INSTITUTE

4403 Sheridan Road, Dept. 1111, Chicago, Ill.

## LEARN WATCH REPAIRING



You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home as good or better than at a shop. You can earn money while learning and secure a well paying

position or start in business after completing our course of instruction. Good watch repairers are always in demand and earn from \$50 to \$75 per week. For particulars apply to the

#### WISCONSIN SCHOOL OF WATCH REPAIRING

524 E. Mason St., MILWAUKEE, WIS.

## UNIVERSITY of CHICAGO

### HOME-STUDY COURSES



Continue your high-school, college or personal program of education. Teachers, Religious and Social Workers. Men and Women in many vocations are using the 450 courses in 45 different subjects to obtain guidance by experts for cultural and for practical purposes. The courses yield credit. Ask for free booklet.

THE UNIVERSITY OF CHICAGO

527 ELLIS HALL

CHICAGO, ILL.

## WELDING ELECTRICITY RADIO AUTOMOBILES

No Fine Training Equipment Anywhere at Any Price. Pipe-Line, Sheet Steel, Structural Steel, Cast Iron, Air-Craft and Commercial Welding; Armature Winding; Power Plants; Switchboards; Transformers; Motors; Generators; Batteries; Radio, Television and Automobiles. LEARN BIG-PAY TRADES AT LOW COST

Write for Information, Mentioning Course Desired.  
Coleman Electrical School, 1428 Main St., Kansas City, Mo.



## Anyone CAN LEARN

No talent or experience necessary. Teaching work. Pays big money. Complete instruction book tells about Alphabet, Colors, Words, Signs, How to Write, How to Read, and How to Speak. Also gives 100 Alphabet and Design. Book bound in durable leather, leatherette edges, and four half-binding. Send for your copy today. \$3.00. C. O. D. 10% extra.



Deluxe Pub. Co., 67 West St., Dept. 20, N. Y. City



# Chance of a Lifetime to Get into ELECTRICITY

**P**ANICS have not cut salaries in the fastest-growing, most prosperous of industries. The facts and figures will amaze you. Here is the greatest opportunity open to ambitious men today.

The millions of men employed in **ELECTRICITY** are not worrying about losing their jobs, or cuts in wages. It doesn't matter what conditions are in other lines—we still use electric light and power—we are building and buying more electric refrigerators than ever before—we have not given up riding on electric street cars—or telephoning—or telegraphing.

So if you are looking for a line that has both a permanent future as well as a secure present—we invite you to investigate **ELECTRICITY**—get a list of the positions open—the salaries paid—the industries that depend on Electricity for light, power and automatic controls—the whole astonishing array of facts and figures that will give you a new idea of **your** chances in the future of Electricity.



E. B. Abraham, Asst. Mgr., U. S. P. Through your employment department I received a position with the Oklahoma Gas and Electric Company and it is entirely satisfactory to me.



Amos B. Barab, Willamette, Or. "In order of fact I have secured employment with Edison Electric Company, bending to operate. I only realize how deep the electrical game is. I wish to thank you very much."

## Office and Factory Men Under 35— WANTED!

Practically ALL companies in all lines need men with Electrical training. Refrigeration, railroading, automobiles, steel mills, paper plants, mines, road-building, manufacturers in all industries are employing the men we prepare. All you need is a little training in Electrical Engineering principles, which we will give you at home, in your spare time. Whatever experience you have now in office or factory—whatever education—won't be wasted. You can move ahead from where you are now. Depression or prosperity—we can promise to help place you in a satisfactory position under money-back penalty! (Read contract at the right.)

### You Can Save Money If You Investigate Now!

We recommend Electricity above all other lines because electrical light, power and conveniences have become a necessity in everybody's life—in home, office, factory and farm. And its future is as solid as the nation itself.

Right now we are making the most astonishing money-saving offer in our 35 years of existence. Monthly payments sharply reduced to encourage more men under 35 to prepare for the coming expansion of the electrical industries. Savings up to \$48.75 cash. So if you are dissatisfied with your present earnings, or worried about your job—here is your chance to get a better-paying position as well as to make your future safe. Just mail the coupon for complete information.

# The American School

Dept. E-947

Drexel Ave. & 58th St.

Chicago

When writing to advertisers please mention Popular Mechanics

Save  
UP TO  
\$48<sup>75</sup>

American School

### Read These 4 Guarantees

1. Guarantee of complete, up-to-date training prepared by noted engineers.
2. Guarantee to help you get a job when you're only half way through the course.
3. Guarantee of tuition credit for previous education and experience.
4. Guarantee of money back after you finish if you are not satisfied.



R. S. Mulligan, President

**LESSON FREE**—to prove that you can learn quickly and easily at home in your spare time. Also Electrical book of facts, free. Just mail coupon.

AMERICAN SCHOOL, Dept. E-947, Drexel Ave. & 58th St., Chicago, Ill. Please send free lesson and tell me about your money saving offer in line marked X below.

- | ELECTRICITY                                     |   |
|---|---|
| <input type="checkbox"/> Architecture           | <input type="checkbox"/> Shop                   |
| <input type="checkbox"/> Building               | <input type="checkbox"/> Superintendent         |
| <input type="checkbox"/> Drafting               | <input type="checkbox"/> High School in 2 years |
| <input type="checkbox"/> Business Management    | <input type="checkbox"/> Structural Steel       |
| <input type="checkbox"/> Accounting             | <input type="checkbox"/> Civil Engineering      |
| <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Auto Engineering       |
|   | <input type="checkbox"/> Highway Engineering    |

Name.....  
St. No.....  
City..... State.....  
Age..... Occupation.....



# LEARN AUTO MECHANICS

## in 8 weeks!

Earn \$50 to \$100 a week as an Auto Mechanic. Never in the history of the automotive business has there been such a demand for TRAINED men. 8 weeks training fits you for a job that's waiting for you or to open your own repair shop. Read what two McSweeney trained men have done. Hundreds of others can tell you facts equally interesting. Don't look for a job! TRAIN for it!

George Smith owns an agency and repair shop in West Alexandria, Ohio. He makes \$200 a week. You can do the same.

His McSweeney training put C. E. Gillespie in charge of State Highway Commission's truck and tractor fleet.

### EIGHT WEEKS of Actual Shop Training

No books or lessons the McSweeney way. First you learn the "why" of everything you do; then under competent instructors, you DO the job. You work on real equipment and machines, with the real tools of the auto expert. In eight short weeks you are TRAINED to hold down a permanent BIG PAY job. Any man 16 to 60 can learn. Write today for New Low Tuition Offer, including

### AVIATION and AUTO ELECTRICITY

Aviation is the new field that is paying big money for specially trained men. The McSweeney course in Auto Mechanics includes Aviation Mechanics. You learn on real airplane engines under experienced instructors. The FREE special course in Auto Electricity is fully described in the Big Auto Book. (Mail the coupon today.)

### MONEY BACK GUARANTEE! FREE RAILROAD FARE!!!

In eight weeks of intensive training; actual shop work with real tools on real equipment; you will be qualified to accept a Big Pay Job as an Auto Mechanic. If you are not satisfied about your qualifications, your tuition will be refunded.

**FREE** Write today for Big Free Book on AUTOS. Get the facts about jobs, about Free Railroad and Low Tuition Offers. Mailing the coupon does NOT obligate you. It obligates ME to tell YOU how you can train for Big Money in eight short weeks.

## McSWEENEY SCHOOLS

### AUTO, TRACTOR and AVIATION

DEPT. A-16-12 CLEVELAND, OHIO

#### Mail Coupon for Free Book

McSweeney Auto, Tractor and Aviation School, Dept. A-16-12, Cleveland, Ohio.  
Without cost or obligation, send me your Big FREE Book on Autos; also full information about your low Tuition offer including R. R. Fare and FREE New Aviation Course.

Name.....  
Street.....  
Town..... State.....

When writing please mention Popular Mechanics

## Play a Gibson GUITAR



Nick Lucas

MAKE everyone love you as they love Lucas, his Guitar and singing. Learn to play your own accompaniment on a Guitar, Banjo, Mandolin or Ukulele. Be popular among your friends.

**FREE TRIAL EASY PAYMENTS**

this **FREE BOOK**  
Gives Valuable Facts—Send for it Now!

**Gibson Inc.**

1203 Parsons St., Kalamazoo, Mich.

## STAMMERING

You can be quickly helped if you stammer or stutter

I know, because I relieved myself after stammering for nearly 20 years. The story of my suffering—and relief—has interested thousands, many of whom have permitted me to help them. Full story of my successful efforts told in 279-page book. Sent anywhere for 10 cents. B. N. BOGUE, 1148 Bogue Building, 1147 North Illinois Street, Indianapolis, Ind.



### Learn Public Speaking

At home—in spare time—20 minutes a day. Overcome "stage-fright," gain self-confidence, increase your salary through ability to sway others by effective speech. Write now for free booklet. How to Work Wonders With Words. NORTH AMERICAN INSTITUTE, Dept. 1309, 3601 Michigan Avenue, Chicago, Illinois



## SONG WRITERS

Don't fail to read "Song Requirements of Talking Pictures, Radio and Records," an explanatory, instructive book SENT FREE on request. New writers may mail song-poems for free examination. We revise, compose and arrange music, and secure copyrights, guaranteeing approval.

P. M. Newman Associates, 1674 Broadway, New York

## GOV'T. POSITIONS

### SPLENDID SALARIES

MEN-WOMEN

#### WE HELP YOU GET ONE

Ry. Mail Clerk	Steno Typist
P. O. Laborer	Immigrant Insp.
R. F. D. Carrier	Seamstress
Special Agent	Auditor
Customs Inspector	Prohibition Agt.
City Mail Carrier	U. S. Border
Meat Inspector	Patrol
P. O. Clerk	Chauffeur
File Clerk	Watchman
General Clerk	Skilled Laborer
Matron	Postmaster
	Typist

Examine Instruction Bureau, Dept. 416, St. Louis, Mo. Send me FREE particulars—How to Qualify for positions marked "X". Salaries, Locations, Qualities, etc. ALL SENT FREE.

Name..... Address.....

AGE RANGE 18 to 50



# I Will Show You Too

## How to Start a Spare Time or Full Time

# Radio Business of Your Own



J. E. SMITH, President  
National Radio Institute

The man who has directed the Home Study Training of more men for the Radio Industry than any other man in America.

Here are a few examples  
of the kind of money  
I train "my boys" to make

### Started with \$5. Now has Own Business



"Can't tell you the feeling of independence N. R. I. has given me. I started in Radio with \$5, purchased a few necessary tools, circulated the business cards you gave me and business picked up to the point where my spare-time earnings were my largest income. Now I am in business for myself. I have made a very profitable living in work that is fun."—Howard Houston, 312 So. Sixth St., Laramie, Wyo.

### Made \$700 in 6 Months Spare Time

"Although I have had little time to devote to Radio, my spare-time earnings for five months after graduation were approximately \$700 on Radio sales, service and repairs. I owe this extra money to your help and interest. Thanks for the interest shown me during the time I studied and since graduation."—Charles W. Lacey, 535 Elan St., Denver, Colo.



### \$7346 Business in two and one-half months

"I have opened an exclusive Radio sales and repair shop. My receipts for September were \$2,332.14; for October, \$2,587.77; and for the first half of November, \$2,376.22. My gross receipts for the two and one-half months I have been in business have been \$7,296.13. If I can net about 20 per cent this will mean a profit of about \$1,500 to me."—John F. Kirk, 1514 No. Main St., Spencer, Iowa.

**My Free book gives you many more letters of N. R. I. men who are making good spare time or full time businesses of their own**

# Without Capital

The world-wide use of receiving sets for home entertainment and the lack of well-trained men to sell, install and service them have opened many splendid chances for spare-time and full-time businesses. Besides Radio's growth is opening hundreds of fine jobs every year. "Rich Rewards in Radio" gives detailed information on these opportunities. It's FREE.

**So many opportunities many  
make \$10 to \$15 a week  
extra while learning**

Many of the ten million sets now in use are only 25% to 40% efficient. The day you enroll I will show you how to do 28 jobs common in most every neighborhood for extra money in your spare time. I will show you the plans and ideas that are making as high as \$200 to \$1,000 for others while taking my course. G. W. Page, 133 Pine St., McKenzie, Tenn., writes: "I made \$935 in my spare time while taking your course."

**Many \$50, \$60, and \$75 a week  
jobs opening in Radio every year**

Broadcasting stations use engineers, operators, station managers, and pay \$1,200 to \$5,000 a year. Radio manufacturers use testers, inspectors, foremen, engineers, service men, and buyers for jobs paying up to \$7,500 a year. Shipping companies use hundreds of operators, give them world-wide travel, board and lodging free, and a good salary besides. Radio dealers and jobbers are continually on the lookout for good service men, salesmen, buyers, managers, and pay \$90 to \$100 a week. Talking Movies pay as much as \$75 to \$200 a week to the right men with Radio training. My book tells you of opportunities in Television, Aircraft Radio and other fields.

### I will train you at home in your spare time

Hold your job until you're ready for another. Give me only part of your spare time. You do not have to have a high school or college education. Hundreds have won bigger success. J. A. Vaughn jumped from \$35 to \$100 a week. E. E. Winborne seldom makes under \$100 a week now. The National Radio Institute is the Pioneer and World's Largest organization devoted exclusively to training men and young men by correspondence for good jobs in the Radio industry.

### You Must Be Satisfied

I will give you an agreement to refund every penny of your money if you are not satisfied with my Lessons and Instruction Service when you complete my course. And I'll not only give you thorough training in Radio principles, practical experience in building and servicing sets, but also Advanced Training in any one of five leading branches of Radio opportunities.

### 64-page Book gives the Facts

Clip and mail the coupon now for "Rich Rewards in Radio." It tells of the opportunities for a spare-time or full-time Radio business of your own; also of the many fine jobs for which my course trains you.

J. E. SMITH, Pres.  
Dept. 1 NP  
National Radio  
Institute  
Washington,  
D. C.

Get  
my new book  
It points out  
what Radio  
Offers You



THIS COUPON IS GOOD  
FOR ONE FREE COPY OF  
MY NEW BOOK

mail  
it  
TODAY

J. E. SMITH, President  
National Radio Institute, Dept. 1 NP  
Washington, D. C.

Dear Mr. Smith: Send me your book. I want to see what Radio offers. I understand this request does not obligate me and that no agent will call.

NAME.....

ADDRESS.....

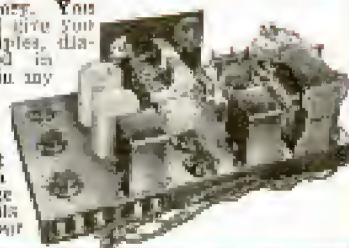
CITY.....STATE.....



Here view of 5-tube Screen Grid Tuned Radio Frequency Set—only one of the many circuits you can build with my outfit.

## You will get Extensive Practical Radio Experience with my Home Experimental Outfits

My course is not all theory. You use the Right Outfits I'll give you in working out the principles, diagrams and circuits used in modern sets and taught in my Lesson books. This 50-50 method of home training makes learning easy, fascinating, interesting. You get as much practical set servicing experience in a few months as the average fellow who hasn't had this training gets in two to four years in the field.



Get the facts on my Lifetime Employment Service to all Graduates

When writing to advertisers please mention Popular Mechanics





## Former mechanic now earns \$9500 a year

"For a good many years I was a mechanic in a garage. I worked hard and one day I was promoted to chief mechanic. Strangely enough, it was then I realized how much technical training I lacked. The other men would ask me questions I could not answer. Besides, I was not content to be a mechanic the rest of my life, so I enrolled for the Automotive Electrician Course of the International Correspondence Schools.

"While studying that course, I got the first idea of owning a garage myself. Then I took another course, the one in Automobile Mechanics, and before I had finished it I had bought half-interest in the garage. Today I own it entirely, and last year my income was \$9500. I believe it will be more this year."

From all over the country we are receiving these true stories about I. C. S. students. There is no reason why some day we should not quote you in an advertisement! You want to make more money—then become a trained man. Start today—mail the coupon!

### INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University"

Box 5574-G, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X:

#### TECHNICAL AND INDUSTRIAL COURSES

- |  |  |
|--|--|
| <input type="checkbox"/> Architect   | <input type="checkbox"/> Automobile Mechanic                                 |
| <input type="checkbox"/> Architectural Draftsman                             | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting     |
| <input type="checkbox"/> Building Estimating                                 | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation        |
| <input type="checkbox"/> Wood Millworking                                    | <input type="checkbox"/> Sheet Metal Worker                                  |
| <input type="checkbox"/> Contractor and Builder                              | <input type="checkbox"/> Steam Engineer                                      |
| <input type="checkbox"/> Structural Draftsman                                | <input type="checkbox"/> Steam Electric Engineer                             |
| <input type="checkbox"/> Structural Engineer                                 | <input type="checkbox"/> Civil Engineer                                      |
| <input type="checkbox"/> Electric Wiring                                     | <input type="checkbox"/> Surveying and Mapping                               |
| <input type="checkbox"/> Electrical Engineer                                 | <input type="checkbox"/> Refrigeration                                       |
| <input type="checkbox"/> Electric Lighting                                   | <input type="checkbox"/> R. R. Locomotives                                   |
| <input type="checkbox"/> Welding, Electric and Gas                           | <input type="checkbox"/> R. R. Section Foreman                               |
| <input type="checkbox"/> Reading Shop Blueprints                             | <input type="checkbox"/> R. R. Bridge and Building Foreman                   |
| <input type="checkbox"/> Telegraph Engineer                                  | <input type="checkbox"/> Air Brakes <input type="checkbox"/> Train Operation |
| <input type="checkbox"/> Telephone Work                                      | <input type="checkbox"/> Highway Engineering                                 |
| <input type="checkbox"/> Mechanical Engineer                                 | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy         |
| <input type="checkbox"/> Mechanical Draftsman                                | <input type="checkbox"/> Coal Mining Engineer                                |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker        | <input type="checkbox"/> Navigation <input type="checkbox"/> Boilermaker     |
| <input type="checkbox"/> Patternmaker  | <input type="checkbox"/> Textile Overseer or Supt.                           |
| <input type="checkbox"/> Pipefitter <input type="checkbox"/> Tinsmith        | <input type="checkbox"/> Custom Manufacturing                                |
| <input type="checkbox"/> Bridge Engineer                                     | <input type="checkbox"/> Wooden Manufacturing                                |
| <input type="checkbox"/> Bridge and Building Foreman                         | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing  |
| <input type="checkbox"/> Gas Engines <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Poultry Farming <input type="checkbox"/> Radio      |
| <input type="checkbox"/> Aviation Engines                                    | <input type="checkbox"/> Marine Engineer                                     |

#### BUSINESS TRAINING COURSES

- |   |  |
|---|--|
| <input type="checkbox"/> Business Management                                  | <input type="checkbox"/> Business Correspondence                             |
| <input type="checkbox"/> Office Management                                    | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |
| <input type="checkbox"/> Industrial Management                                | <input type="checkbox"/> Stenography and Typing                              |
| <input type="checkbox"/> Personnel Management                                 | <input type="checkbox"/> Complete Commercial                                 |
| <input type="checkbox"/> Traffic Management                                   | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> Accountancy <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Railway Mail Clerk                                  |
| <input type="checkbox"/> C. P. Accountant                                     | <input type="checkbox"/> Grade School Subjects                               |
| <input type="checkbox"/> Bookkeeping  | <input type="checkbox"/> High School Subjects                                |
| <input type="checkbox"/> Secretarial Work                                     | <input type="checkbox"/> College Preparatory                                 |
| <input type="checkbox"/> Spanish <input type="checkbox"/> French              | <input type="checkbox"/> Illustrating <input type="checkbox"/> Cartooning    |
| <input type="checkbox"/> Salesmanship <input type="checkbox"/> Advertising    | <input type="checkbox"/> Lumber Dealer                                       |

Name.....Age.....

Address.....

City.....State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

When writing please mention Popular Mechanics

## Learn Autos in Los Angeles

Come West at Our Expense!

For a limited time we are making a railroad fare offer from any point in the United States to Los Angeles. Just think of it! A trip to California with your railroad fare allowed.

Quickly Train for Big Pay Jobs

Quickly train for Big Pay Jobs in Auto work. Unlimited Lifetime Employment Service. Employers insist on our men instead of green, half-baked mechanics who don't know what it's all about. You need good training to earn Big Pay!

Don't Worry About Money! We'll Help You!

If you are short of money, we'll help you. We help you secure a part time job to earn living expenses while learning.

It's Easy at National!

Short, condensed training in our Million Dollar Practical "School of Shops"... instruction on the most modern equipment money can buy... with the country's best staff of expert, experienced instructors. No previous experience needed. None too old or too young to learn. Start any time. WRITE TODAY! We'll send you the full story about Railroad Fare Offer, Unlimited Employment Service, etc. New Book sent FREE.

# FREE BOOK

## NATIONAL AUTOMOTIVE SCHOOL

Dept. 124-A 4006 So. Figueroa St., Los Angeles, California

## \$60 a Week in AVIATION

Is what R. N. Dobbins of New York makes as Aviation Instructor. WALTER HINTON, first Trans-Atlantic Pilot, trained Dobbins at home, in spare time—and Hinton will train YOU too. Hinton's EMPLOYMENT DEPARTMENT got Dobbins his job and can help you CASH IN on YOUR training. Prepare for one of the thousands of big pay jobs ON THE GROUND or in the air that pay up to \$100 per week and more. Write now for FREE Book that gives all details about this training and a FREE FLIGHT. BIG SAVINGS ON FLYING INSTRUCTION. FREE AIRCRAFT RADIO COURSE—Walter Hinton, Pres., Aviation Institute of U.S.A., Inc., Suite 601-G, 1115 Connecticut Ave., N. W., Washington, D. C.



## HOT PIANO

Jazz taught by mail. Note or ear. Easy rapid lessons for adult beginners. Also Self-instruction system for advanced pianists. Learn 358 Bass Styles, 976 Jazz Breaks, hundreds of Trick Endings, Hot Rhythms, Rock, Stomp and Dirt Effects; Symphonic and Wicked Harmony in latest Radio and Record Style. Write for Free Booklet.

WATERMAN PIANO SCHOOL, 1824 W. Adams St., Los Angeles, Calif.



Learn to Draw Today. Write for my Free Book, "How to become a Good Designer." It contains suggestions and tells how colors should be used in your life. Your name appears prominently on a card of your choice among the people. Write today. F. W. TAMBLYN, 418 Ridge Blvd., Kansas City, U. S. A.

## CARTOON YOUR WAY TO SUCCESS!

DON'T COPY—LEARN TO ORIGINATE! RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS as home that you can SELL! Course contains 28 lessons and over 600 illustrations. All for only \$2.85. Send name and address for free details.

RAYE BURNS SCHOOL, 335 Lakewood Rd., D-4, Cleveland, Ohio



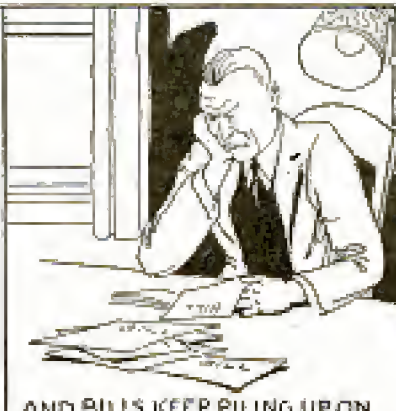
## IT ISN'T SUCH A BUM WORLD AFTER ALL!!



WHEN YOU WORK UNDER A SIMON  
LEOREE STRAW BOSS' WITH A TIME  
CLOCK STARING AT YOU ALL THE TIME—



AND YOU NEVER HAVE  
ANYTHING IN YOUR POCKETS  
EXCEPT A HOLE —



AND BILLS KEEP PILING UP ON  
YOU TILL YOU CAN'T SEE  
HOW IN THE SAM HILL YOU'RE  
EVER GOING TO GET OUT OF DEBT—



AND THEN YOU FIND A LITTLE  
BOOK THE KEY TO SECRETS WHICH  
HAVE MADE THOUSANDS COMFORTABLY  
WELL OFF AND EVEN RICH—



AND YOU START USING THOSE  
SECRETS YOURSELF AND LEARN  
WHAT IT IS TO REALLY MAKE  
BIG MONEY AS A SALESMAN —



OH FELLERS IT ISN'T SUCH  
A BUM WORLD AFTER ALL

## When Men Raise Their Pay \$3,000 to \$7,000 a Year ...After Reading This Little Free Book!

A MARVELOUS little free book is bringing vital news to thousands of men today and making momentous changes in their lives. Just forty-eight pages—about seven ounces of paper and printers' ink; but there are thousands of men holding down big-pay jobs all over the United States and Canada with earnings running up to \$10,000 a year, and even bigger, who started by reading this great book.

Take, for instance, Frank J. Walsh of Ludlow, Massachusetts. Just a few years ago, Walsh was struggling along on \$1,000 a year. In just one evening, reading this little free volume, he made the change in his life that raised his pay over 600%.

Shortly after Walsh got his start, a California cowboy named William Shore spent an evening reading this book in a ranchhouse. It wasn't many months later when he told us of one week when he made \$525 clear, as a salesman. And more recently, a man in Grand Rapids, Michigan—L. Van Houten—got tired of plugging along in his old job. The same book showed him the way out of his ill-paid rut—raised his pay to \$200 a month, an increase of over 400%.

Men from all walks of life—men who never dreamed they could master the secrets of salesmanship—regular fellows just like anybody else, without any extra advantages of money or education—that's what these men are. This little book, and the marvelous N. S. T. A. Demonstration Method, are specially planned to help just that kind of men—ambitious average fellows. The N. S. T. A. does something which people said could not be done—it makes salesmen—successful high power earners, out of average men with normal every-day brains. It has proved that salesmen do not have to be "born." It

teaches, in easy, yet thorough lessons right in your home the secrets which great salesmen have spent years on the road to learn.

You can't keep a good man down—not if he really is a good man and will take advantage of his opportunities to rise in life. This book, "The Key to Master-Salesmanship," brings ambitious men the chance they've all been looking for—the chance to get away from dull routine time-clock jobs at low pay. It tells all about the free placement service which is constantly at the disposal of members when ready and qualified.

Right now this book, "The Key to Master-Salesmanship," which showed these men how to get started on the road to success and independence, will be mailed as a gift to any ambitious man—absolutely free and without obligation. Why not see for yourself what amazing pay-raising secrets it contains? There is no better way to invest a two cent stamp! Simply fill out and mail the coupon to us today.

**NATIONAL SALESMEN'S TRAINING  
ASSOCIATION**

Dept. W-104, N. S. T. A. Bldg., Chicago, Illinois

**National Salesmen's Training Association, Dept. W-104,  
N. S. T. A. Bldg., Chicago, Ill.**

Please send me free and without obligation my copy of "The Key to Master-Salesmanship," and full details of your Free Employment Service and other special "Earn While You Learn" features.

Name.....  
Address.....  
City.....State.....  
Age.....Occupation.....

When writing to advertisers please mention Popular Mechanics



# Amazing Offer

to  
**Two Hundred Ambitious Men**  
Interested in Auto Engineering

**YOU SHOULD BE INTERESTED IN THIS OFFER:** nobody has ever equalled it in the opportunities it presents for **INCREASED EARNINGS**. **READ EVERY WORD OF IT.** Don't skip a sentence because only two hundred men will have a chance to profit by it.

Everybody knows the American School with its tens of thousands of students all over the world, everybody knows of the American Technical Society, publishers of technical reference books—a company with over a million dollars of resources. We, the American Technical Society, have just arranged with the American School to offer you a full course of instruction in **AUTOMOBILE ENGINEERING** at almost **NO COST** and to include with it our complete, six volume encyclopedia of Automobile Design, Construction, Repair.

There are no strings to this offer whatever, but it is positively limited to two hundred courses. It offers you an unparalleled opportunity to forget the fear of wage cuts and lay-offs, to command a salary instead of wages and become an expert or executive instead of mere workman. The automobile industry is coming back with a BANG—soon you will have your opportunity if you're ready for it.

## SAVE NEARLY ONE HUNDRED DOLLARS

On this great offer you get the benefit of a complete course of instruction which would cost you at least \$100 more elsewhere, and on conditions so easy anyone can meet them.

### Course Includes

complete set of Study sheets, Question blanks, Examination sheets. Grading by instructors. Books have over 2500 pages, 3000 charts and illustrations. Every phase of automobile design, construction and repair. Standard in practically every great University Library.

You must promise to spend thirty minutes a day (on an average) with the material we send you. You must convince us that you are really serious and want to make progress. The low price quoted is for advertising purposes only and when these two hundred courses are sold we will have no more to offer at this price.

Think of it. You deposit only \$2.00 when the complete course, including six big automobile text books is delivered to you and then send \$1.00 a month until the total price of only \$24.50 is paid—not one penny more do you pay us. And—think of this—these books alone have never been offered for less than \$24.50.

### Examination FREE

When you send the coupon—you don't promise to pay anything unless ten days examination and trial has proved that this course can help you to a better job and bigger pay and that its presentation of all automobile problems, makes it worth many times the price. This advertisement is appearing in only one other magazine so this is your only chance.

## A GREAT CAREER NOW OPEN TO YOU

The enormous automobile industry has enabled thousands to become successful, but only those who had special training—who knew what they were talking about and who could design, build or repair, are numbered among the **BIG MEN**. If you are in this field now—prepare yourself for advancement. If you want to enter it—put yourself in a position to enter it upon a basis where you can meet the competition of other **TRAINED** men. Don't delay one single minute but mail the coupon now.

### SEND NO MONEY

If you want to take advantage of this truly startling proposal send the coupon today. We will send you immediately the school's complete course of instruction and will include with it the six big text books.

Look them over, read the lesson sheets, find out anything you want to know, convince yourself that here lies an amazing opportunity, enabling you to defy the hazards of mere casual employment and give you a position of independence and security. When you have satisfied yourself then decide. Remember, you get all of the instruction and material which would be included in a course, selling elsewhere for at least \$100 more.

**AMERICAN TECHNICAL SOCIETY,**  
Drexel at 58th Street, Chicago, Dept. A-515.

Gentlemen: You may read me the complete course which you offer in your special advertisement. Include the six big automobile books. I will deposit \$2.00 upon delivery with the understanding that this is to be returned immediately if I send the books and the course back to you within ten days. If I keep them, I will pay you \$1.00 in thirty days and then \$3.00 a month until a total of only \$24.50 has been paid. I promise to study an average of thirty minutes a day.

Name.....

Address.....

City.....

### Offer Includes

Free Consultation Privileges With Eighteen Experts

and a membership in the American Technical Society. You may write or wire any time for information on details and the experts will be glad to assist you without cost.

# BE A RAILWAY TRAFFIC INSPECTOR



## RAILWAYS AND BUS— Earn Big Money Plus Expenses Travel or Remain Near Home

**TRAINED MEN**—19 to 55—needed in Railway and Bus Passenger Traffic Inspection. Interesting work under important officials; big opportunity for advancement to executive positions. Pleasant, unexcelled profession in growing bus line and railway passenger field.

Thorough, simple home-study course takes only a few weeks. On graduation, we assist you in getting paying \$120 to \$150 per month up, plus expenses, to start or extend tuition. Come little—return easy.

Write for Free Booklet and complete explanation that tells what Traffic Inspection can do for you.

**Standard Business Training Institute**  
Div. 212 BUFFALO, N. Y.

# Wrestling Book FREE

Learn at Home



Be an expert wrestler. Learn at home by mail. The greatest

wrestlers of all, Frank Gotch and Farmer Burns, both world's champions have prepared the most wonderful course of lessons ever written on Scientific Wrestling. Physical Culture, Self Defense and Jiu-Jitsu. No strong, healthy, with an attractive body. Handle and control bigger and stronger men with ease. Get this Free Prospectus—25 pages—brimming with thrilling information—No Charge—merely send \$3 to cover postage. Don't delay. Write Today for your copy. State your age.

**FARMER BURNS SCHOOL, 3273 Courtyard Bldg., Omaha, Neb.**

### CRIME DETECTION SECRET SERVICE AND FINGER PRINTS

# SECRET SERVICE BOOK FREE

For 30 Days Reading  
**No Money Down—Actual Crime Cases—**  
If You Are Quick!—We will send you this stirring book on Crime Detection, Secret Service and Identification Work for 30 days free reading. Send no money. If you decide to keep it, then send only \$1.00, if not, return it. **WRITE TODAY.** Not sent to boys under 17 years of age.

**T. G. Cooke, Book Dept. 13-59 1920 Semside Ave., Chicago**

# BE AN OIL EXPERT!

New, easy, practical way to learn at home in spare time. Geology, Drilling Methods, Pipe Line Transportation, Refining and Marketing. Write Today! **FREE Book!**

**PETROLEUM ENGINEERING UNIVERSITY, Dept. 220-C, FORT WAYNE, IND.**



# "BECOME A LIGHTNING TRICK CARTOONIST"

Send \$1.00 for Launch Producing Program of 25 Trick Drawings with Instructions. Catalog of Cheap Talk Supplies Free. **BALDA ART SERVICE, Dept. 1, Oakton, Wis.**

# Stop Slamming Doors EARN \$15 Daily!



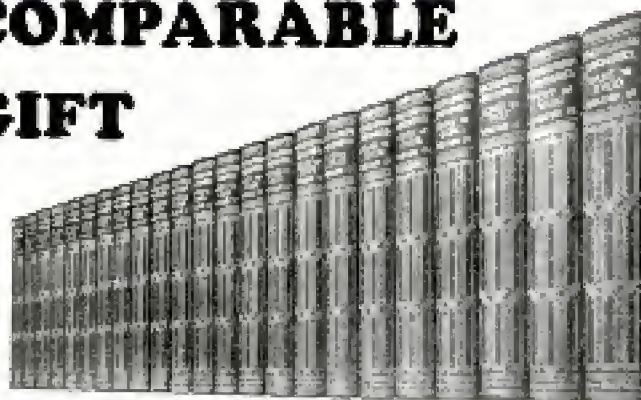
Kant-Slam Door Check is an amazing new invention that stops all doors slowly and automatically. Working speed easily adjusted by turning screw at top of check. Holds doors open when wanted open. Operates on new oil principle. Low priced. Everlasting. Easily installed in 10 minutes. Never needs attention.

**A REAL DEMONSTRATION FURNISHED Every Agent**  
You get orders quickly demonstrated actual results on door to carry installation door. Every office, factory, store, institution and public building needs a Kant-Slam for every door. Rush order and address for details of amazing money making opportunity. **DEMONSTRATOR FREE**

**KANT-SLAM DOOR CHECK CO., Dept. S-7, Bloomfield, Ind.**



# The New BRITANNICA at a New Big Saving is the INCOMPARABLE GIFT



Order a  
**BRITANNICA for Christmas**  
AT THE NEW AND LOWER PRICE

**A**PPROACHING holidays always mean a smart increase in the demand for the Britannica. This year the increase is already considerably larger than usual, and we fully expected it. For today the new 14th Edition of Britannica can be bought at a saving of many dollars.

As we announced some weeks ago, our order for a single printing of the Britannica, equal to the largest ever made, makes it possible to effect substantial savings in the cost of production. *This saving is passed on to you.*

The increased holiday response sustains our belief that the printing will soon be sold out. We can't assure you that the great reduction, possible because of an unusual year, will ever be offered again, once this printing is gone.

*So send immediately for particulars, if you wish the new Britannica for Christmas at the lowest price at which it has been possible to advertise it.*

## A gift to buy without delay

At any price it would be an exceedingly handsome and discriminating gift, reflecting the thoughtfulness and good judgment of the giver and giving endless delight and solid service to the recipient.

At the present price you can make this splendid gift to some fortunate person and, at the same time, secure a really substantial saving over the regular standard prices of last Christmas.

No one can call it mere chance that 80,000 families find the Britannica useful in the home.

It was made to help women in their housework, in the care of their children, in sewing, in their appreciation of music, drama, literature and painting. It was made to help men in their daily work, in the care of the car, in matters of science, law, business, politics, sports and hobbies. It was made to help children with their lessons.

The Britannica has already proved its value in all these respects. Today is the right time to buy it.

**SEND FOR FREE BOOKLET TODAY**

## What Owners say:

"Comprehensive and authoritative. Nothing has been left undone to make it thorough and complete."

**Charles E. Hughes**  
Chief Justice of the U. S.  
Supreme Court

☆

"One of the first things we must have for ourselves as well as for our children is some kind of general reference library, and I find that the Encyclopaedia Britannica fills this need admirably."

**Mrs. F. D. Roosevelt**

☆

"The new Encyclopaedia Britannica contains material for a very large degree of self-education on the part of any individual having access to it."

**Ernest M. Hopkins**  
President,  
Dartmouth College

☆

"It is the ideal encyclopaedia for a home with children—indeed, for any home."

**Willis A. Sutton,**  
Recent President, Natl.  
Education Association

☆ ☆  
☆



## The Finest Gift

Many people may not realize that the twenty-four volumes carry 35,000,000 words. The text is written by 3,500 authorities and is illustrated with 15,000 pictures, many in full color, and with 500 maps. There are 500,000 separate entries in the index.

## \$5 down and \$5 a month

Only \$5 down is required to bring the gift to any home for immediate use. The balance is payable in a small number of monthly installments of \$5 or more.

## 56-Page FREE Booklet

Fill out the coupon blank below, mail it to us, and receive by return mail a large 56-page booklet free, rich with color plates, maps and sample pages. It contains a full description of this finest gift in books. Send the coupon for the large booklet today. No obligation.



**ENCYCLOPAEDIA BRITANNICA, Inc. 1 P.M.—13**  
**342 Madison Ave., New York City**

Please send me, by return mail, without obligation, your 56-page illustrated booklet with color plates and maps from the New Britannica, and low price offer representing a saving of many dollars.

Name.....

Address.....

City..... State.....





## This way it's easy to learn Art at Home!

Get into the big money! Learn a real profession that puts you head and shoulders above the average. Artists start to earn large salaries almost at once, and the opportunities are unlimited. Our student M. A. Heikilla now has a fine advertising job with one of the country's largest corporations. He earns over \$3600 a year. Harry Hatzenduchler of Dubuque, Iowa, earns over \$10 a day extra from his drawings.

These men had no previous experience in art. Our famous method of "constructive criticism" by which you receive constant, personal, individual attention turned them into real, professional commercial artists.

The Washington School of Art has been training men to draw for over fifteen years. Our methods are proved. Our course is interesting and easy to master. Simple lessons lead you step by step into the most fascinating profession in the world. We show you how to make good money in your spare time, how to start earning almost with the very first lesson. Our big employment department is at your service. Get the facts about this training—about the rich rewards that an Artist's Life offers you. Send now for our FREE BOOK. MAIL COUPON TODAY!

### FREE!

Big \$300 price contest open to those who act at once. Send now for free book.



### \$150 a Week for Roberts

"When I enrolled for your course I knew nothing about commercial art. Now I make signs, showcards, illustrations and cartoons earning from \$60 to \$150 a week, depending on whether I feel like working or not. I cannot thank you enough." P. C. Roberts, Bridgeport, Me.

## Free Book shows how

Washington School of Art, Dept. 5-W,  
1115 15th St. N. W.,  
Washington, D. C.

Please send me your FREE BOOK showing how I can quickly learn art at home.

Name: ..... Age: .....

Address: .....

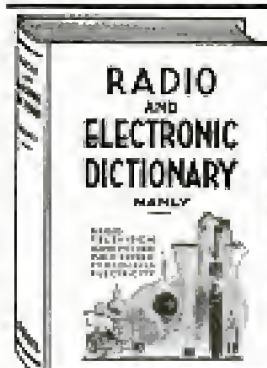
City: ..... State: .....

When writing please mention Popular Mechanics



Now Ready!

## THE BOOK THAT THOUSANDS of MEN HAVE WAITED FOR RADIO and ELECTRONIC DICTIONARY



Size 6 x 9 inches.  
300 pages.  
550 illustrations.  
3800 definitions.  
Price Only \$2.50

Right up-to-the-minute with definitions of the words and terms used in all branches of radio, including aviation, navigation and industrial control — photoelectricity and photo-cell applications — sound pictures — public address systems — television — telephotography — electricity and magnetism.

No longer need ambitious men be handicapped because they have no means or facilities for keeping up with the new words and terms used in radio and the electronic field. The RADIO AND ELECTRONIC DICTIONARY, just published, gives you, at your finger tips, 3800 practical definitions which you must know to insure your success in radio and its sister industries. 550 specially made illustrations help to simplify difficult points. Get your copy now—only \$2.50. It's an indispensable handy guide for the beginner and experienced radio man alike. Order it today. Your money back if not pleased.

**FREDERICK J. DRAKE and CO.**  
181 NORTH MICHIGAN AVE...CHICAGO

Drake Books are for sale at all Booksellers

## TRI-STATE COLLEGE

DEGREE IN 2 YEARS



B. S. DEGREE in Civil, Electrical, Mechanical, Chemical, Aeronautical Engineering in 2 years. Those who lack high school may make up work. Living costs, tuition low.

4121 College Ave., Angola, Ind.

Catalog

## LEARN WATCHMAKING and ENGRAVING



### BY OUR PROFIT-SHARING PLAN OUR GRADUATES SUCCEED

One of our Iowa students started in a very small way—now doing over \$20,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for FREE BOOK.

Chicago School of Watchmaking, Dept. 7801, 155 N. Clark St., CHICAGO



## STRONGFORT PUTS PEP INTO THE WEAKLING

**STRONGFORTISM**—The Science of Health and Strength—works wonders with run-down, weakly, skinny men. It builds them up to health through internal muscular development, then rounds them out into robust physical specimens by bringing into play every muscle and making every muscle do its work as Nature intended. You'll be astonished how quickly you'll feel the benefits of this famous health and strength Course. You'll feel like a new man almost from the first day you start under my instructions. You'll be surprised at the lazy muscles you wake up when you begin, and they'll wake you up in turn. You'll quickly realize that a new day has dawned for you.

Send for MY FREE BOOK

"Promotion and Conservation of Health, Strength and Mental Energy" — revelation of inside facts about the human body—telling how you can be revitalized and built up to be a manly man — how to rid yourself of various ailments and weaknesses.

STRONGFORT  
Builder of Men

Fill out and mail this Consultation Coupon  
**LIONEL STRONGFORT**, Strongfort Institute, Dept. 150, Newark, N.J.

Please send me your book on "STRONGFORTISM."

Name: .....

Age: ..... Occupation: .....

My ailment is: ..... Send: .....

City: ..... State: .....



# Who else wants to learn to play....

at home without  
a teacher, in  $\frac{1}{2}$  the usual  
time and  $\frac{1}{3}$  the usual cost?



**O**VER 600,000 men and women have learned to play their favorite instruments the U. S. School of Music way!

That's a record of which we're mighty proud! A record that proves, better than any words, how *thorough*, how *easy*, how *modern* this famous method is.

Just think! You can quickly learn to play any instrument—directly from the notes—and at an average cost of only a few cents a day.

You study in your own home, practice as much or as little as you please. Yet almost before you realize it you are playing real tunes and melodies—not dull scales, as with old-fashioned methods.

## Like Playing a Game

The lessons come to you by mail. They consist of complete printed instructions, diagrams, and all the music you need. You simply can't go wrong. First you are *told* what to do. Then a picture *shows* you how to do it. Then you do it yourself and *hear* it. No private teacher could make it any clearer.

As the lessons continue they become easier and easier. For instead of just scales you learn to play by *actual notes* the favorites that formerly you've only *listened* to. You can't imagine what fun it is, until you've started!

Truly, the U. S.

School method has removed all the difficulty, boredom, and extravagance from music lessons.

## Fun—Popularity

You'll never know what real fun and good times are until you've learned to play some musical instrument. For music is a joy-building tonic—a sure cure for the "blues." If you can play, you are always in demand, sought after, sure of a good time. Many invitations come to you. Amateur orchestras offer you wonderful afternoons and evenings. And you meet the kind of people you have always wanted to know.

Never before have you had such a chance as this to become a musician—a really good player on your favorite instrument—without the deadly drudging and prohibitive expense that were such drawbacks before. At last you can start right in and get somewhere, quickly, cheaply, thoroughly.

## Here's Proof!

"I am making excellent progress on the 'cello—and owe it all to your easy lessons," writes George C. Lauer of Belfast, Maine.

"I am now on my 12th lesson and can already play simple pieces," says Ethel Harnischfeger, Fort Wayne, Ind. "I knew nothing about music when I started."

"I have completed only 20 lessons and can play almost any kind of music I wish. My friends are astonished," writes Turner B. Blake, of Harrisburg, Ill.

And C. C. Mittlestadt, of Morn, Minn., says, "I have been playing in the brass band for several months now. I learned to play from your easy lessons."

You, too, can learn to master the piano, violin, 'cello, saxophone—any in-

strument you prefer—this quick, easy way! For every single thing you need to know is explained in detail. And the explanation is always *practical*. Little theory—plenty of *accomplishment*. That's why students of the U. S. School course get ahead *twice as fast* as those who study by old-fashioned, plodding methods.

## Booklet and Demonstration Lesson—FREE!

The whole interesting story about the U. S. School course cannot be told on this page. A booklet has been printed, "Music Lessons in Your Own Home," that explains this famous method in detail, and is yours free for the asking. With it will be sent a Free Demonstration Lesson, which proves how delightfully quick and easy—how *thorough*—this modern method is.

If you really want to learn to play at home—without a teacher—in one-half the usual time—and at one-third the usual cost—by all means send for the Free Booklet and Free Demonstration Lesson AT ONCE. No obligation. (Instruments supplied if desired—cash or credit.) U. S. SCHOOL OF MUSIC, 712 Brunswick Bldg., New York.

Thirty-fourth year  
(Established 1898)

U. S. SCHOOL OF MUSIC,  
712 Brunswick Bldg., New York City

Please send me your free book, "Music Lessons in Your Own Home," with introduction by Dr. Frank Crane, Free Demonstration Lesson and particulars of your easy payment plan. I am interested in the following course:

Have You  
Instrument? .....

Name.....

Address.....

City.....State.....

### Pick Your Instrument

Piano	Violin
Organ	Clarinet
Ukulele	Flute
Cornet	Saxophone
Trombone	Harp
Piccolo	Mandolin
Guitar	'Cello
Hawaiian Steel Guitar	
Sight Singing	
Piano Accordion	
Italian and German Accordion	
Voice and Speech Culture	
Harmony and Composition	
Drums and Traps	
Automatic Finger Control	
Banjo (Plectrum, 5-String or Tenor)	
Junior's Piano Course	

When writing to advertisers please mention Popular Mechanics



# ELECTRICITY

**PAYS  
BIG!**

## LEARN IN 90 DAYS ON ACTUAL MACHINERY—NO BOOKS I'LL PAY YOUR R-R FARE TO CLEVELAND

Don't let the world bluff you. Get into electricity—earn \$50.00 to \$150.00 a week—and hold your head as high as the next man. You can do it easily by coming to my famous electrical school. In 12 short weeks you'll pack in many years of practical knowledge. You work shoulder to shoulder with expert instructors on full-sized, moving, whirling motors, generators, batteries, switchboards, telephone

### No Education or Experience Needed

No books to read. No dry lectures to listen to. You learn by doing. I don't care if you can't tell a motor from a horse—

hurry now. When you graduate I guarantee that you'll know electricity from "A" to "Z." If you're not tried to fill a big-pay job I'll refund every penny of your tuition.

etc., etc. McSweeney trained men get the biggest paying jobs. Every day I receive requests for graduates.

### Satisfaction Guaranteed!

You are the sole judge of McSweeney training. Your tuition will be refunded if, upon graduation, you are not satisfied.

### Big Illustrated Book Sent FREE

Today, right now, take the first step out of that low pay rut. Send this coupon to me for big, illustrated book on **ELECTRICITY**. Act today. Get my special Railroad Fare offer and Remarkable Tuition offer.

Just Mail Coupon

### IT'S EASY THIS WAY

Fascinating, practical shop work in my big school fits you. Not a correspondence course.



**RADIO  
COURSE  
IN-  
CLUDED**



J. H. McSweeney, Pres.,  
McSweeney Electrical School,  
Dept. E-10-12, Cleveland, O.

Dear Sir: Within obligation send me a copy of your big book on **ELECTRICITY**, also Railroad Fare offer, and details of Enrollment Service.

Name.....

Address.....

Town.....

State.....

## McSWEENEY ELECTRICAL SCHOOL

Dept. E-10-12

Cleveland, Ohio

## ★ VETERANS get preference for Civil Service jobs!

There is security and opportunity in government positions. And honorably discharged soldiers, sailors and marines are given a bonus of 5 points in their examinations—disabled veterans, 10 points! Veterans need earn a rating of only 65%, disabled veterans 60% to have their names placed on the eligible register. Disabled veterans are then placed at the head of the register. The Civil Service Commission is authorized to hold special quarterly examinations for veterans entitled to disability preference.

International Correspondence Schools today are helping veterans all over the country qualify for government jobs. I. C. S. Civil Service Courses are designed to cover examination requirements and are complete. Mark and mail the coupon!

INTERNATIONAL CORRESPONDENCE SCHOOLS  
Dept. 5578-G, Scranton, Pa.

I am a ☐ veteran ☐ disabled veteran, age ( ) and my present occupation is . Please send me, without obligation, complete information on how I can get a permanent position in government service.

Name.....

Address.....

When writing to advertisers please mention Popular Mechanics

## LAW

**STUDY AT HOME**  
Legally trained men, who high pay jobs and big money in private and public life. Be independent. Greater opportunities now than ever before. Big corporations are headed by men with legal training. Earn \$5,000 to \$10,000 Annually.  
We guide you step by step. You can train at home during spare time. Degrees of LL. B. conferred. Successful graduates in every section of the United States. We furnish all text material, including excellent reference Law Library. Low cost, easy terms. Get our valuable 84-page "Law Guide" and "Bridges" books FREE. Send for them NOW.  
La Salle Extension University, Dept. 1264-L, Chicago  
The World's Largest Business Training Institution

## MUSIC LESSONS IN YOUR HOME



You can play music like this quickly

Write today for our FREE BOOKLET and DEMONSTRATION LESSON. It tells how to learn to play Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc. Beginners or advanced players. You play, you learn. Costs you only a few cents a day. Thousands of satisfied students.  
**AMERICAN SCHOOL of MUSIC, 51 Manhattan Bldg., CHICAGO**

## All This for Only 15 Cents

Send only 15c RIGHT NOW and receive The Pathfinder every week by mail for the next 13 consecutive weeks. In these 13 issues you will get 426 pages, with 300 pictures, 900 unusually interesting articles on people and things you want to know about, 1800 picked news items from everywhere, 1500 jokes, quotes and cracks, stories, etc. Newsies, magazines, most entertaining paper in the whole world. The biggest 15c worth YOU ever saw. Send now. Address **Pathfinder, Dept. 74, Washington, D. C.**

## Workmen's Compensation Benefits For Injury Arising Out of Employment

This is explained fully in a new book written particularly for employees of all classes. It instructs workers and their families how to obtain these benefits and should be in every household. Write today for this valuable book of practical information. Full price \$1.00. Money back guarantee. **EDUCATOR BOOK COMPANY, P. O. Box 515, Los Angeles, California.**



# Opportunities

were never so great for technically trained men!



**You Can  
Learn  
Practical**

## DRAFTING

**At Home By Mail**  
UNDER EXPERT  
COLLEGE INSTRUCTORS

No other calling open to young men of limited schooling, leads so quickly and surely as drafting to big-pay jobs. The field is enormous—world wide. Wake up! Look around you! This is a mechanical and engineering age. Consider our amazing inventions, sky-scrapers, ocean liners, air ships, aeroplanes, automobiles, industrial plants, bridges, dams, power houses, etc. Every-

thing planned or built comes first through the hands of expert draftsmen. What creative work could be more fascinating—a greater inspiration and guide to worthwhile careers? Scores of our noted architects, engineers and builders won their way to fame and leadership with a common school education and a self-acquired knowledge of drafting.



## \$100 a Week Paid Expert Draftsmen

Let the facts about Chicago TECH successes prove that you, too, can train in spare time. Send the coupon below. Investigate! You'll be amazed when you learn how easily young men have mastered drafting through our practical home-study plan. Nothing difficult about it—the simplest, shortest, step-by-step method you can imagine . . . the result of years of successful experience in teaching by mail and in our resident classes. Read the stories of Chicago TECH successes in our big catalog. Hundreds of our graduates are now engineers, architects, designers, builders, contractors, chief draftsmen, superintendents. Drafting was the ladder on which they climbed to big incomes. Chicago TECH is

famed everywhere for its successful graduates. Don't delay another minute. Send for all the interesting facts at once. Our low cost and easy terms place this training within the reach of every ambitious man. The first small tuition payment brings everything needed to start the course. Draftsman's table, all drawing instruments, tools, etc.—a complete, high-grade outfit is furnished each student free of extra cost.

**Send For  
Proof Today!**

*Let the success  
of others be your  
guide to a big-  
pay job.*

## Big FREE Book on DRAFTING

Send coupon now for your copy. Tells everything you want to know—what to do and how to do it—to succeed quickly in practical drafting work. Opportunity is calling. This is the big chance you've long wanted. Grasp it today.

## HOME-STUDY Courses Offered In TECHNICAL Subjects

Instruction and training is under faculty members same as in our Chicago school. 60 subjects; 27 years success. Home-study work carries credit toward our resident courses leading to diploma or Bachelor of Science Degree. Check and mail coupon, or write in margin, subject on which you wish information.

## Chicago TECHNICAL College

Dept. R-204, 118 E. 26th St., Chicago

Please send information on course marked with X.

### (Partial List)

- |   |   |
|---|---|
| <input type="checkbox"/> Drafting               | <input type="checkbox"/> Plan Reading (Buildings) |
| <input type="checkbox"/> Mathematics            | <input type="checkbox"/> Plumbing and Heating     |
| <input type="checkbox"/> Architecture           | <input type="checkbox"/> Electricity              |
| <input type="checkbox"/> Civil Engineering      | <input type="checkbox"/> Surveying                |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Chemistry                |
| <input type="checkbox"/> Mechanical Engineering | <input type="checkbox"/> Algebra                  |
| <input type="checkbox"/> Structural Engineering | <input type="checkbox"/> Geometry                 |
| <input type="checkbox"/> Highway Engineering    | <input type="checkbox"/> Trigonometry             |
| <input type="checkbox"/> Machine Design         |   |
| <input type="checkbox"/> Building Estimating    |   |

Name ..... Address .....  
City ..... State ..... Age ..... Occupation .....

☐ Check here if you prefer to attend the College in Chicago.

When writing to advertisers please mention Popular Mechanics



# CONTACT

**H**OW many industries can you name that will double in size in the next five years? Aviation has an excellent opportunity to multiply itself ten-fold in that time. And this rapidly expanding industry demands more and more men that are trained properly.

Here at VON HOFFMANN, study standards are high. Frankly there are no soft spots. It takes grit, ambition and hard work to make the Von Hoffmann grade. That is why Von Hoffmann men are always in demand. Train with us for your place in aviation!

VON HOFFMANN AIR COLLEGE 1000-431  
342 Lambert-St. Louis Municipal Airport  
St. Louis, Mo. MAIL TODAY, "WHAT  
AVIATION OFFERS YOU."

Name.....Age.....  
Address.....  
City.....State.....  
I am interested in  
☐ Flying Course ☐ Mechanics Course  
☐ Welding Course ☐ Home Study



Von Hoffmann Air College  
—fully accredited and licensed by the United States  
Department of Commerce—is  
the world's outstanding commercial flying school.



**VON HOFFMANN AIR COLLEGE**  
LAMBERT ST. LOUIS AIRPORT ST. LOUIS, MO.

## Big Money in Do-Nuts



READ  
WHAT  
OWNERS  
SAY:

"Ringer Do-Nuts sell themselves. People who taste them once come back for more."

"My little boy sold 31 dozen in less than one hour."

"Was out of a job—now making over \$75 per week—expect to order more machines soon."

"I have done very well and am well satisfied."

GET INTO YOUR OWN  
BUSINESS—  
BE INDEPENDENT!

Make more in a week than many men in a month, with the easy-to-operate Ringer Electric Do-Nut Machine!

Earn profits of 100% and more, making delicious greaseless do-nuts. It's easy! Men and women all over the U. S. are making money in this different business. They're independent. They're happy.

Everybody likes delicious greaseless do-nuts, baked by electricity. No fat or oil to spoil digestion. They're tasty, healthful, and sell like wild-fire!

An investment of less than \$60 plus a willingness to work can make you independent. Investigate now! No experience needed. Do the work right in your kitchen. We teach you, furnish all formulas, guide you to success. Write or wire today for free plan.

**RINGER DO-NUT CO.**

142 Main St. N. E.  
Minneapolis, Minnesota

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of *Popular Mechanics Magazine*, published monthly at Chicago, Ill., for October 1, 1931.

State of Illinois, County of Cook, ss.  
Before me, a notary public in and for the state and county aforesaid, personally appeared H. H. Windsor, Jr., who, having been duly sworn according to law, depose and say that he is the editor and business manager of the *Popular Mechanics Magazine* and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit: First, That the name and address of the publisher, editor, managing editor, and business manager are: Publisher, *Popular Mechanics Co.*, 205 East Ontario St., Chicago, Ill.; Editor, H. H. Windsor, Jr., 205 East Ontario St., Chicago, Ill.; Managing Editor, J. B. Selver, 205 East Ontario St., Chicago, Ill.; Business Manager, H. H. Windsor, Jr., 205 East Ontario St., Chicago, Ill.; Second, That the owner is: (1) owned by a corporation. Its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given. *Popular Mechanics Company*, 205 East Ontario St., Chicago, Ill.; L. B. Windsor, 205 East Ontario St., Chicago, Ill.; H. H. Windsor, Jr., 205 East Ontario St., Chicago, Ill. Third, That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None. Fourth, That the two paragraphs next above giving the names of the owners, stockholders, and security holders, if any, contain and truly the full list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; and that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. H. H. WINDSOR, Jr., Editor and Publisher. Sworn to and subscribed before me this 29th day of September, 1931. J. GRAMHAM, Notary Public. (My commission expires June 15, 1933.)

**FREE**  
CATALOG OF  
PRACTICAL  
BOOKS...

Complete description of Drake books, covering RADIO, AVIATION, ENGINEERING, AUTOMOBILE WORK, BATTERY WORK, ELECTRICITY, BUILDING, SHEET METAL WORK, PAINTING, SIGN MAKING, LETTERING, COMMERCIAL ART, will be sent to you on request.

**Frederick J. Drake & Co.**  
181 N. Michigan Blvd. Chicago

**\$1000 Extra For YOU**

Stopberger makes that in SPARE TIME, broadcasting from Station WJLV, Washington, D. C. Hundreds of others playing for Radio, in Orchestras, etc.—BIG PAY FOR YOU!—Free Book tells you all about QUICK, EASY Way to Master popular Hawaiian Guitar. Write for it Today! HAWAIIAN STUDIO 32121, New York Academy of Music, 100 Fifth Ave., New York City



# WANTED

**\$20 to \$35 a week men who want to earn \$50 to \$75 a week and more**

**T**ODAY—more than any time before in the history of the great Radio Industry—Manufacturers, Broadcasting Stations, Sound Picture and Television concerns, and others—are on the lookout for men capable of being promoted to their more responsible jobs.

They can get all the men they want for their ordinary work—jobs that pay \$20 to \$35 a week or less. Which, of course, is one reason why these jobs don't pay better wages—almost any man can do the work.

But for their better-paying jobs—those jobs that pay \$50 to \$75 a week and up—well, it's different. Here brains, not muscle, are required. Here knowledge, not guess work is necessary. Here men capable of some day being promoted to still better-paying jobs are needed. This big demand for men of this type has been brought about by the amazingly rapid expansion of the Radio field. Because of dozens and dozens of new, and almost revolutionary, developments, hundreds and hundreds of big-pay jobs have been created almost over-night.

Radio work is no longer limited to the building and servicing of Radio sets. It now includes such other things as Sound Pictures, Public Address Systems, Radio in Industry, Radio in Aviation, Radio aboard ship (for operating mechanisms of different kinds, and even for running the ship itself), telephotography, Television, etc.—everything, in fact, that makes use of the vacuum tube or photo-electric cell.

Radio devices, today, are operating great machines formerly operated by man—are grading by color or size such manufactured articles as cigars, paper, silks, etc.—are counting people or automobiles as they go by any given point—are turning on and off lights in our big factories or on our city streets—are operating airplanes in the air—directing ships at sea from stations on land—creating music more perfect than played by our best masters—and doing a thousand other things not dreamed of a few years ago.

To know Radio is to know the principles of all of these things.

And to such men the great Radio Industry offers many wonderful opportunities—steady work at good pay, NOW—and an early advancement to still better-paying jobs, as a future.

But no ordinary knowledge of Radio will do. To qualify for these better-paying jobs—men must know the theory and practical application of all Radio devices—old and new, and they should be able to teach other men some of the things they know.

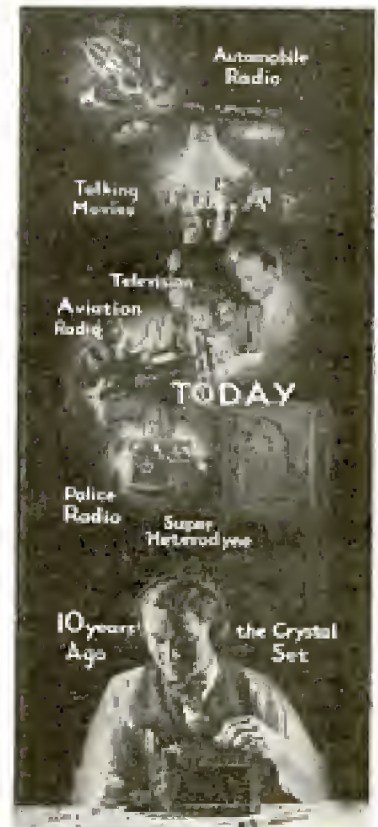
That means they must be "trained."

As few men can afford to get this training at some College or University, the Radio and Television Institute, of Chicago, was organized to train men at home—no matter where they live—in their spare time—easily and quickly—and at a cost of only a few cents a day.

The Radio and Television Institute Course of home-training is actually supervised by an Advisory Board of outside business men,—all highly paid engineers and executives,—each actively connected with some large Radio concern. It is also endorsed by fifteen of our largest and most progressive manufacturers of Radio and Television equipment. These public endorsements were given to guide ambitious men who seek a future in Radio. These manufacturers want all such men to know that the Radio and Television Institute has their unqualified approval, and their hearty support, in its work of training men, through spare-time home-study, for the many better-paying jobs that exist today in Radio . . . Sound Pictures . . . and Television work.

Radio and Television Institute home-training prepares men, easily and quickly, for these better-paying jobs. It is the ONE recognized connecting link between ambitious men and a splendid future in Radio.

To the man, then, who is earning \$20 to \$35 a week NOW—and who would like to earn \$50 to \$75 a week or more—regardless of whether or not he is doing Radio work today—we say in all honesty—"we think we can help you." Just mail the coupon below for full particulars of our plan and a free copy of the new Opportunity Book.



Radio—first an experiment—then a plaything—now a giant industry—the fastest growing industry the world has ever known—offering thousands of wonderful opportunities to ambitious men.

## RADIO AND TELEVISION INSTITUTE

DEPT. 19, 2130 LAWRENCE AVENUE, CHICAGO

Please send me a copy of your Opportunity Book and full particulars of your plan for helping men into good pay positions in the Radio field.

Name.....

Address.....

City.....State.....

*When writing to advertisers please mention Popular Mechanics*



**My Pay-Raising Plan**  
Engineer Dobe

# Free

**BETTER JOB BETTER PAY**

Mail  
Coupon  
Now!

YOURS for the asking! No cost whatsoever! No conditions. Just reply promptly. This offer is open to all who speak up NOW!

Men trained by me in practical drafting are making \$60.00, \$70.00 and even \$100.00 per week. Get busy. Be ready when your time comes. Get your drafting tools and drafting table just as soon as you begin training.

Drafting is the field for the men who want to get somewhere. For the men who want to be heard from. They get pay that makes working worth while and life worth living.

### This Opportunity Does Not Call for Cash

Don't keep yourself down by thinking of your finances at this time. It isn't money I want. It's men. You, if you mean business. Get started and you will get action. I will teach you draftsmanship by the practical methods that make a man easily and quickly finish the whole course. I will have you ready to draft for important pay in any engineering or industrial line you like before you know it.

Take a look at these tools. Not a student's outfit at all but an imported set of professional drafting instruments.

## FREE

of all extra cost. You also get an engineer's drafting table and standard supplies, all when I train you.

Send coupon for "Pay-Raising Plan."



### FREE PAY RAISING PLAN

ENGINEER DOBE, Div. 13-59  
1951 Lawrence Avenue, Chicago

Send me free and postpaid, your book, "My Pay-Raising Plan," also Practical Draftsmanship Book and Special Offer on all Drafting Tools and Table furnished to me without extra cost.

REPLY  
PROMPTLY

Name .....

Address .....

City ..... Age .....

When writing please mention Popular Mechanics

Up To **\$50** A DAY  
With Tiny 'PHONE "MIKE"

Agents are clamoring up everywhere with a phone attachment that looks like a radio mike. Absolutely controls all sounds in your phone—ends the roar that keeps you from hearing clearly; makes it easy to hear even if your phone is in the noisiest factory. Yet also assures privacy—talk unheard, with people within five feet of you!

Write and find out how agents report earnings up to \$50 a day and even more with this tiny mechanical mystery. No quantity order. Free starter, office, etc.; amazing sales plus double calls and sales. Write for FREE introductory offer and Amazing Sales Questionnaire.

STANDARD APPLIANCES, INC., Dept. W-91, 21 W. Elm St., Chicago, Ill.

**LEARN TO DRAW**  
Cartoons—Comic Strips—Illustrations

You will be SURPRISED when you learn of the low price of THE ACE OF CARTOON COURSES

Send your name and address for FREE particulars and sample illustrations.

CARL ANDERSON SCHOOL, Madison, Wis.

**Learn Advertising at Home**

Make money in advertising. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free booklet—"Win Success in Advertising", and full particulars. No obligation.

Page-Davis School of Advertising  
3601 Michigan Ave., Dept. 1359, Chicago, U. S. A.

**ELECTRICAL ENGINEERING**

A COMPLETE comprehensive course for men of limited time, complete in one year. Mathematics, engineering drawing, shop-work. Students construct motors, install wiring, test electrical machinery. Buildings drawn. 23 years' successful experience. Catalog on request.

**BLISS ELECTRICAL SCHOOL**  
122 Takoma Ave., Washington, D. C.

**1000 POULTRY SECRETS**

Our famous home-study Poultry Course teaches how to get more eggs, cut feed bills, avoid losses. Methods used by successful Poultry raisers the world over. FREE Book tells all about Course. Write today for your free copy. National Poultry Institute, Dept. 411-D, Washington, D. C.

**Minstrels** Comedy Stunts Plays Jokes

Unique First Parts for complete show with special songs and choruses. Make-up, Catalog Free.

T. S. Denison & Co., 623 E. Wabash, Dept. 19 Chicago

**EARN MONEY AT HOME**

YOU can make \$15 to \$50 weekly in spare or full time at home coloring photographs. No experience needed. No canvassing. We instruct you by our new simple Photo-Color process and supply you with work. Write for particulars and Free Book to-day.

The IRVING-VANCE COMPANY Ltd.  
356 Hart Building, Toronto, Can.





# Want a Steady U. S. Government Job?

## RAILWAY POSTAL CLERKS COMMENCE \$1900 YEAR

Many U. S. Government Jobs Open to Men and Women 18 to 50

POST OFFICE CLERKS—IMMIGRANT INSPECTORS  
RURAL CARRIERS GENERAL OFFICE CLERKS  
INSPECTORS OF CUSTOMS—CITY MAIL CARRIERS

These are steady positions. Strikes, poor business conditions, lockouts or politics will not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "HARD TIMES" in the U. S. Government Service.

### RAILWAY POSTAL CLERKS

Railway Postal Clerks now get \$1000 the first year regular, being paid on the first and fifteenth of each month, \$70.15 each pay day. Their pay is quickly increased, the maximum being \$2700 a year, \$112.50 each pay day. They get extra allowance for hotel expenses when away from home.

### PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). On runs they usually work three days and have three days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. Spring examinations expected in a number of states.



### CITY MAIL CARRIERS—POST OFFICE CLERKS

Clerks and Carriers commence at \$1700 a year and automatically increase \$100 a year to \$2100 with further increases to \$2300. They also have 15 days vacation. City residence is unnecessary.

### GENERAL CLERKS—FILE CLERKS

(Open to men or women 18 to 50)  
Salary \$1200 and \$1440 to \$2500 a year. Pleasant clerical work in the departments and offices at Washington, D. C., and throughout the country.

### WHAT WILL YOU EARN FIVE YEARS FROM NOW?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, kicking around from post to pillar, no chance in sight for PERMANENT employment, frequently out of a position and the year's average salary very low. DO YOU EARN \$1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET \$2700 OR MORE A YEAR EVERY YEAR?

FRANKLIN INSTITUTE  
Dept. K174  
ROCHESTER, N.Y.

Rush to me, entirely free of charge (1) a full description of the position checked below; (2) Free copy of Illustrated 32-page book, "U. S. Government Positions and How to Get Them"; (3) Tell me how to get the Position checked.

Railway Postal Clerk.....(\$1900-\$2700)  
Post Office Clerk.....(\$1700-\$2300)  
City Mail Carrier.....(\$1700-\$2100)  
Rural Mail Carrier.....(\$2100-\$3400)  
General Clerk—File Clerk.....(\$1260-\$2500)  
Inspector of Customs.....(\$2100-\$3300)  
Immigrant Inspector.....(\$2100-\$3000)

Name.....

Address.....

Use This Coupon Before You Mislay It—Write or Print Plainly

When writing to advertisers please mention Popular Mechanics



### GET FREE LIST OF POSITIONS

Fill out the coupon. Tear it off and mail it to-day—now, at once. DO IT NOW—This investment of two cents for a postage stamp may result in your getting a U. S. Government Job.





## \$1,000 Reward

### For the Capture of This Man

**CONVICT 6138**, escaped from the State Penitentiary; Name, Charles Condray; age 37; Height, 5 feet 8 inches; Weight, 141 pounds; Hair, light brown; Eyes, gray.

Easy enough to identify him from his photograph and this description, you may say—but, Condray took the name of "Brown," dyed his hair, darkened his skin, grew a mustache, put on weight and walked with a stoop.

Yet he was captured and identified so positively that he knew the game was up and returned to the penitentiary without extradition. How was it accomplished? Easy enough for the Finger Print Expert. They are the specialists, the leaders, the cream of operators. Every day's paper tells their wonderful exploits in solving mysterious crimes and convicting dangerous criminals.

### More Trained Men Needed

The demand for trained men by governments, states, cities, detective agencies, corporations, and private bureaus is becoming greater every day. Here is a real opportunity for YOU. Can you imagine a more fascinating line of work than this? Often life and death depend on finger print evidence—and big rewards go to the expert. Many experts earn regularly \$1,000 and more per year.

### Learn At Home in Spare Time

And now you can learn the secrets of this science at home in your spare time. Any man with common school education and average ability can become a Finger Print Operator in surprisingly short time.

### FREE The Confidential Reports No. 38 Made to His Chief!

IF YOU ACT QUICK—We will send you free and with no obligation whatsoever, a copy of the gripping, fascinating, confidential report Secret Service Operator No. 38 made to His Chief. Mail coupon NOW!

Write quickly for fully illustrated free book on Finger Prints which explains this wonderful training in detail. Don't wait. Mail the coupon now. You may never see this announcement again! You assume no obligation. You have everything to gain and nothing to lose. Write at once. Address

**Institute of Applied Science**  
Dept. 13-59 1920 Sunnyside Av., Chicago

**INSTITUTE OF APPLIED SCIENCE,**  
Dept. 13-59 1920 Sunnyside Ave., Chicago

Gentlemen: Without any obligation whatever, send me your new, fully illustrated, FREE book on Finger Prints and the free copy of the Confidential Reports Operator No. 38 made to His Chief. Literature will NOT be sent to boys under 17 years of age.

Name .....

Address .....

Age .....

When writing to advertisers please mention Popular Mechanics

# Electricity!

## Learn in Los Angeles

### Come West at Our Expense!

For a limited time we are making a railroad fare offer from any point in the United States to Los Angeles. Just think of it! A trip to California with your railroad fare allowed.

### Quickly Train for Big Pay Jobs

Quickly train for Big Pay Jobs in Electricity. Unlimited Lifetime Employment Service. Employers insist on our men instead of green, half-baked electricians who don't know what it's all about. You need good training to earn Big Pay!

### Don't Worry About Money!

#### We'll Help You!

If you are short of money, we'll help you. We help you secure a part time job to earn living expenses while learning.

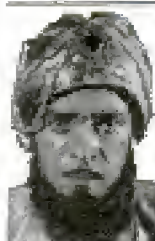
### It's Easy at National!

Short, condensed training in our Million Dollar Practical "School of Shops"... Instruction on the most modern equipment money can buy... with the country's best staff of expert, experienced instructors. No previous experience needed. None too old or too young to learn. Start any time. **WRITE TODAY!** We'll send you the full story about Railroad Fare Offer, Unlimited Employment Service, etc. Now Book sent **FREE**.

## FREE BOOK

**NATIONAL ELECTRICAL SCHOOL**

Dept. 134-E 4006 So. Figueroa St., Los Angeles, California



# Astrology

### Will You Be Lucky in 1932?

What do the stars foretell for 1932? Would you like to know? Our special 13-page Astrological Reading gives predictions, month by month—with exact days, dates and hours—for 1932 based on your sign of the Zodiac. Consult it before making any changes in home or business affairs, signing papers, love, marriage, seeking employment, raises in salary, promotion, travel, friends, enemies, health, accidents, lucky days etc. Send exact birthday with \$1.00 for reading.

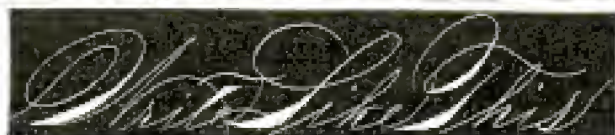
Franklin Pub. Co., 300 N. Clark St., Dept. 1159, Chicago

# for MORE PAY learn From An ENGINEER

## DRAFTING

Practical Home training UNTIL IN POSITION. Salary paid Draftsmen \$40 to \$75 per week and up. I'll train a number of selected students on practical work as Draftsmen, or improve your present job to get a raise. I furnish you all tools and drawing table. Write for FREE PAY-RAISING Drafting Book.

ENGINEER DOBE, 1951 Lawrence Ave., Div. 33-59 Chicago



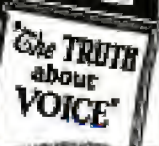
Wonderful, new device, guides your hand; corrects your writing in a few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Osment, Dept. 34, St. Louis, Mo.

# "The TRUTH about VOICE"

### SENT FREE No Obligation to Buy

If you act quick—we will send you postpaid—for 30 days free reading—new Voice Book describing starting FACTS! Sent out over hundreds of dollars to every man or woman seeking a strong, rich voice for either singing or speaking. 30 days free reading—then send \$1. Otherwise, return it.

Prof. E. Feuchtinger 308 North Michigan Avenue Studio 13-59 Chicago, Ill.





**"I'll prove in only  
7 days I can make  
YOU a NEW  
MAN!"**

BY

*Charles  
Atlas*

Holder of the Title: "The  
World's Most Perfectly  
Developed Man"

**N**O other Physical Instructor in the world has ever DARED make such an offer as I am making you now! I have proved to thousands that my system of building powerful, big-muscled men begins to show real results in only 7 days—and I can prove it to you.

You don't have to take my word for it. You don't have to take the word of my hundreds of pupils who have added inches to their chests, biceps, necks, thighs and calves in only a few days. No, sir! You can prove for yourself—in just one week—by the change you see and feel in your own body—that you can actually become a husky, healthy NEW MAN, a real "Atlas Champion."

## Gamble a 2c Stamp - - mail the Coupon for my FREE BOOK!

**J**UST give me a week, I'll prove I can make a New Man of you—but you in magnificent physical condition which wins you the envy of any man and the admiration of every woman.

My system of *Dynamic-Tension* rebuild me from a 97-pound weakling to "The World's Most Perfectly Developed Man." You can have big and balanced muscular development like mine in the same easy way.

You begin to FEEL and SEE the difference at once, without using any tricky apparatus, any pills, "rays" or unnatural dieting. My *Dynamic-Tension* is a natural method of developing you inside and out. It not only makes you an "Atlas Champion," but goes after such ailments as constipation, pimples, skin blotches, and other weak-

nesses that keep you from really enjoying life.

Don't be an underweight, always-tired weakling! I'll build you up to man-size proportions, cover your shoulders, chest and legs with smooth layers of new muscle, put "punch" into your whole system.

Gamble a 2c stamp today. Mail coupon for free copy of my new book, "*Everlasting Health and Strength*." It shows you, from actual photos, how I have developed my pupils to my own perfectly balanced proportions. Where shall I send your copy? Put your name and address down on the coupon. Mail it today to me personally.

**CHARLES ATLAS**

Dept. 8-M, 133 E. 23rd St., New York City

When writing to advertisers please mention *Popular Mechanics*



**CHARLES  
ATLAS, Dept.  
8-M, 133 E. 23rd St.,  
New York City**

I want the proof that your system of *Dynamic-Tension* will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "*Everlasting Health and Strength*."

Name..... (Please print or write plainly)

Address.....

City..... State.....



# There is Security and Opportunity in DRAFTING

DRAFTING is one of the best professions a young man can choose because it pays good salaries and it is the stepping stone to even better positions. Many leading architects, mechanical engineers and electrical engineers got their start at the drafting board.

There is no easier way to learn Drafting than through the International Correspondence Schools. The practical value of these courses is shown by the success of I. C. S. students and also by the fact that employers are constantly writing us for trained men. We receive more calls for I. C. S. draftsmen than for graduates of any other course.

"Starting as a cove boy in a foundry, advancing to moulder, patternmaker and machinist, I felt the need of special training and enrolled with the I. C. S. I am now employed in a responsible capacity in engineering development for U. S. Aluminum Company.

JAMES M. Fox, Chief Draftsman,  
U. S. Aluminum Company, New Kensington, Pa."

There is no doubt that Drafting offers a real opportunity to ambitious men and it will pay you to investigate it. Just mark and mail the coupon and we'll gladly send you a booklet telling all about the I. C. S. courses in Drafting or any other subject in which you are interested.

## INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University"

Box 3575-G, Scranton, Penna.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject before which I have marked X:

### TECHNICAL AND INDUSTRIAL COURSES

- |  |  |
|--|--|
| <input type="checkbox"/> Architect   | <input type="checkbox"/> Automobile Mechanic                                 |
| <input type="checkbox"/> Architectural Draftsman                             | <input type="checkbox"/> Plumbing <input type="checkbox"/> Steam Fitting     |
| <input type="checkbox"/> Building Estimating                                 | <input type="checkbox"/> Heating <input type="checkbox"/> Ventilation        |
| <input type="checkbox"/> Wood Millworking                                    | <input type="checkbox"/> Sheet Metal Worker                                  |
| <input type="checkbox"/> Contractor and Builder                              | <input type="checkbox"/> Steam Engineer                                      |
| <input type="checkbox"/> Structural Draftsman                                | <input type="checkbox"/> Steam Electric Engineer                             |
| <input type="checkbox"/> Structural Engineer                                 | <input type="checkbox"/> Civil Engineer                                      |
| <input type="checkbox"/> Electric Wiring                                     | <input type="checkbox"/> Surveying and Mapping                               |
| <input type="checkbox"/> Electrical Engineer                                 | <input type="checkbox"/> Refrigeration                                       |
| <input type="checkbox"/> Electric Lighting                                   | <input type="checkbox"/> R. R. Locomotives                                   |
| <input type="checkbox"/> Welding, Electric and Gas                           | <input type="checkbox"/> R. R. Section Foreman                               |
| <input type="checkbox"/> Heating Shop Blueprints                             | <input type="checkbox"/> R. R. Bridge and Building Foreman                   |
| <input type="checkbox"/> Telegraph Engineer                                  | <input type="checkbox"/> Air Brakes <input type="checkbox"/> Train Operation |
| <input type="checkbox"/> Telephone Work                                      | <input type="checkbox"/> Highway Engineering                                 |
| <input type="checkbox"/> Mechanical Engineer                                 | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy         |
| <input type="checkbox"/> Mechanical Draftsman                                | <input type="checkbox"/> Coal Mining Engineer                                |
| <input type="checkbox"/> Machinist <input type="checkbox"/> Toolmaker        | <input type="checkbox"/> Navigation <input type="checkbox"/> Refrigeration   |
| <input type="checkbox"/> Patternmaker  | <input type="checkbox"/> Textile Overseer or Supt.                           |
| <input type="checkbox"/> Pipefitter <input type="checkbox"/> Tinsmith        | <input type="checkbox"/> Cotton Manufacturing                                |
| <input type="checkbox"/> Bridge Engineer                                     | <input type="checkbox"/> Wooden Manufacturing                                |
| <input type="checkbox"/> Bridge and Building Foreman                         | <input type="checkbox"/> Agriculture <input type="checkbox"/> Fruit Growing  |
| <input type="checkbox"/> Gas Engines <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Poultry Farming <input type="checkbox"/> Radio      |
| <input type="checkbox"/> Aviation Engines                                    | <input type="checkbox"/> Marine Engineer                                     |

### BUSINESS TRAINING COURSES

- |   |  |
|---|--|
| <input type="checkbox"/> Business Management                                  | <input type="checkbox"/> Business Correspondence                             |
| <input type="checkbox"/> Office Management                                    | <input type="checkbox"/> Lettering Show Cards <input type="checkbox"/> Signs |
| <input type="checkbox"/> Industrial Management                                | <input type="checkbox"/> Stenography and Typing                              |
| <input type="checkbox"/> Personnel Management                                 | <input type="checkbox"/> Complete Commercial                                 |
| <input type="checkbox"/> Traffic Management                                   | <input type="checkbox"/> Civil Service <input type="checkbox"/> Mail Carrier |
| <input type="checkbox"/> Accountancy <input type="checkbox"/> Cost Accountant | <input type="checkbox"/> Railway Mail Clerk                                  |
| <input type="checkbox"/> C. P. Accountant                                     | <input type="checkbox"/> Grade School Subjects                               |
| <input type="checkbox"/> Bookkeeping  | <input type="checkbox"/> High School Subjects                                |
| <input type="checkbox"/> Secretarial Work                                     | <input type="checkbox"/> College Preparatory                                 |
| <input type="checkbox"/> Spanish <input type="checkbox"/> French              | <input type="checkbox"/> Illustrations <input type="checkbox"/> Cartooning   |
| <input type="checkbox"/> Salesmanship <input type="checkbox"/> Advertising    | <input type="checkbox"/> Lumber Dealer                                       |

Name.....Age.....

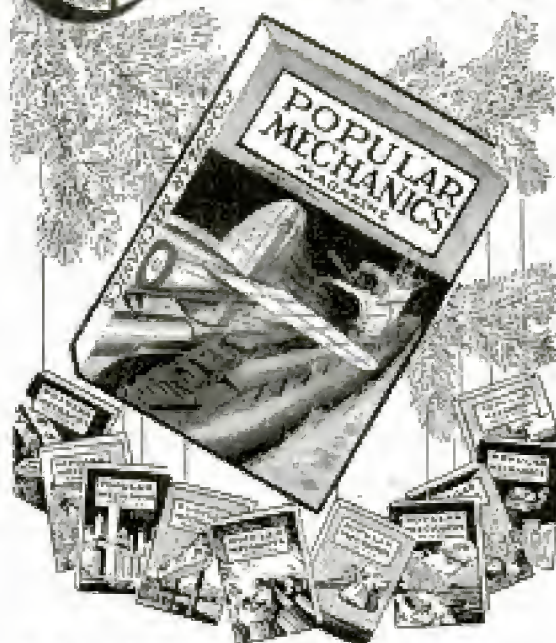
Address.....

City.....State.....

Occupation.....

If you reside in Canada, send this coupon to the International Correspondence Schools, Canadian, Limited, Montreal, Canada

# Save on Your Christmas Gifts



MAKE three friends happy on Christmas and all the rest of the year—besides saving \$1.50 for yourself. A gift subscription to Popular Mechanics Magazine is a reminder every month for 12 months and can't be beaten as a gift for a man or boy.

Every issue of this entertaining and valuable magazine contains 176 pages and over 400 pictures of fascinating events in every corner of the world. The Romance of Modern Progress is told in pictures and simple language. Radio enthusiasts, home craftsmen and practical shopmen are shown countless "easy-to-make" conveniences that save time, labor and money.

Order three subscriptions, save \$1.50  
Price for one year is \$2.50 but until January 1, 1932, you may order 3 one-year subscriptions for only \$6.00—and an engraved Christmas card will be sent to each subscriber for you.

- |    |                        |        |
|----|------------------------|--------|
| 3— | one-year subscriptions | \$6.00 |
| 1— | two-year subscription  | \$4.00 |
| 1— | one-year subscription  | \$2.50 |

Foreign and Canadian subscriptions \$1.00 per additional.

Mail your order to:

Xmas Gift Dept., Popular Mechanics Magazine  
200 East Ontario St., Chicago, Ill.

\$ **7.50** for \$ **6.00**



# NOW-A Powerful New 11-Tube

## Pentode Variable-Mu Super Heterodyne

**With Real  
Automatic  
Volume Control**

*Only*  
**\$37.50**  
COMPLETELY  
ASSEMBLED  
WITH LARGE  
DYNAMIC  
SPEAKER



**30  
DAYS  
FREE  
TRIAL**

**Coast  
to Coast—Easy  
with a Midwest**

Never before has such power been built into an eleven-tube super-heterodyne. Coast to coast programs come in as clear and strong as locals. "Received beautiful orchestra program direct from Texas in mid-afternoon," writes J. Brill, Ohio. Fred Rolf of Missouri says, "I have operated many radios, but your Midwest Super-Heterodyne is the finest in the U. S. A."

**BEAUTIFULLY ILLUSTRATED 20-PAGE CATALOG SENT FREE!**

Mail the coupon below for big, free 20-page catalog beautifully illustrated with many gorgeous Midwest models. The newest and most powerful radios that can be bought today—and at prices far below retail prices. Don't wait—mail the coupon now—get complete details and Free Catalog. No obligation.

**Mail this Coupon for Complete  
Details and Big FREE Catalog!**

Midwest Radio Corp.,  
Dept. 20

Cincinnati, Ohio.

Without obligation on my part send me your new 1932 catalog, and complete details of your liberal 30-day free trial offer. This is NOT an order.

Name.....

Address.....

Town.....State.....

☐ Send me SPECIAL USER AGENTS PROPOSITION.

**USER AGENTS**  
We pay you BIG MONEY just for showing your radio to friends and neighbors. Easy EXTRA MONEY! Check coupon for details.

of your liberal 30-day free trial

offer. This is NOT an order.

Name.....

Address.....

Town.....State.....

☐ Send me SPECIAL USER AGENTS PROPOSITION.

AGAIN—One of America's most famous and oldest radio manufacturers offers the Radio sensation of the year! A powerful, new, 11-tube Super-Heterodyne at the amazingly low price of \$37.50—and combining all the new 1932 features—Pentode Tubes, Variable Mu Tubes, Real Automatic Volume Control, Balanced Unit, Super-Heterodyne Circuit, etc. This is just one of the startling radio bargains from the great selection illustrated in the big FREE, 1932 Midwest Catalog. At our risk, entertain yourself for 30 full days absolutely FREE, then decide. Compare Midwest Radios with the best sets on the market. Convince yourself. We guarantee you 100% satisfaction. Midwest can make this daring offer, only because of the excellent quality, and proven performance of these new and longer distance radios. If you're looking for a powerful, 11-tube, Screen Grid, Super-Heterodyne, with all the new features—pin-dot selectivity and amazing new sensitivity—mail coupon immediately for FREE trial offer, and beautiful new 1932 catalog.



**Complete Line of  
Consoles**

The big FREE catalog beautifully illustrates the complete line of gorgeous Midwest Consoles. "Deluxe," "High-Key" and "Lowboy" models.

**Deal Direct with Factory  
Save Up to 50%  
Terms as Low as \$5.00 Down**

Direct to customer selling makes the surprisingly low Midwest prices possible. Know what it means to have one of the latest and most powerful radios on the market—with all the new 1932 improvements in tone, clarity, selectivity—at about half what you would pay in retail stores.

Absolute guarantee of satisfaction protects you and eliminates all risk. And don't forget—you try any set you select for 30 full days. ABSOLUTELY FREE. You must be delighted. Mail coupon for beautiful new FREE catalog and complete details of FREE TRIAL, easy payment plan. You'll be amazed.

**MIDWEST RADIO CORP.**

Dept. 20

CINCINNATI, O.

When writing to advertisers please mention Popular Mechanics





**Now Less than \$100.00**  
Automatic - Economical - Easy Terms

Now for less than \$100 you can end all your winter worries—coal, ashes, soot, and dirt. Frozen pipes and cold morning floors. ENJOY CAREFREE AUTOMATIC OIL HEAT. The New and Improved 1932 LACO costless than ever, and is yours now on the easiest terms. Our New Low Cost Method of manufacturing makes possible the greatest price reduction in history. It has swamped our dealers with orders. Thousands of satisfied, happy users. It's actually as CHEAP AS COAL. Equipped with full automatic controls—no thermostat, just as the ordinary kitchen range. Won't interfere with the radio, and operates so quietly you seldom hear it. Attractively finished. Built of finest materials. Guaranteed. Designed to eliminate service.

#### SPECIAL OFFER

Send us now for our SPECIAL LOW PRICE Offer, less than \$100. Special Easy Payment Plan. While today, telling number means you want to test and present type heating system. Do it now and SAVE!

#### Dealers Wanted

**NEW LOW PRICES** swing dealers with orders. A chance of a lifetime to get into business for yourself. No experience. Small investment. Big Profits. Specialize at once. **SPECIAL OFFER IF YOU ACT NOW. FEW OPENINGS LEFT FOR LARGE JOBS.** Listed as Standard by Underwriters Laboratories.



#### SAVES FUEL BILLS

This amazing new Removable Gas Generating Chamber, turns oil into gas and burns it with air. Cuts fuel costs to a fraction. Eliminates all waste. Now burns longer with less attention. Burns either oil or gas. Ends smoke, soot, and grease. Get the complete story of this amazing discovery that revolutionized oil heat! Write today.

#### QUICKLY INSTALLED

No matter what kind of heating system you have, LACO FITS INSTANTLY. No breaking free bowl or lighting furnace. Any good mechanic can put it in. No steps must be taken.

#### 26 SIZES and MODELS

An exact type for every home. Heats two rooms or twenty stories. Apartments, homes, factories. Also famous LACO MODEL P—World's Lowest Priced, cheapest to operate. Power burner for heavy use and 24 West Coast Diesel Oil. Send for Beautifully Illustrated folders FREE. Select the burner suited for your needs. Do it today. ENJOY AUTOMATIC OIL HEAT AND SAVE MONEY ON YOUR FUEL BILLS, TOO.

**LACO OIL BURNER CO.** 150 Union Street  
GRISWOLD, IOWA, U. S. A.



## 1000 Positions Open

HOTEL, club, restaurant and institutional field calling for trained men. Thousands of positions Manager, Assistant Manager, Steward, Room Clerk, Sports Director and many other important positions paying \$2,000 to \$5,000 a year, open annually. Nearly one billion dollars' worth of NEW HOTELS, APARTMENT HOTELS, CLUBS AND INSTITUTIONS being built this year. Lewis trained men start at salaries up to \$2,500 a year, living often included.

#### Previous Experience Proved Unnecessary

Qualify for a fascinating, well-paid position—our Personal Coaching Plan adapts the training to your needs in spare time. Lewis-trained men of both young and mature age winning success. A good grade school education, plus Lewis Specialized Training, qualifies you. Nationwide Employment Service FREE of extra charge. All of your training under the personal supervision of Clifford Lewis, who was appointed Managing Consultant by over 300 hotels. Send coupon today for Free Book, "Your Big Opportunity," explaining our Money-Back Agreement, and our Personal Coaching Plan.

#### FREE BOOK COUPON

Lewis Hotel Training Schools,  
Room DW-383, Washington, D. C.

Send me without obligation the Free Book, "Your Big Opportunity," and details of your Personal Coaching Plan.

Name.....

Address.....

City.....

State.....



## Professional STAGE TAP DANCING

Learn At Home New Easy Way. Surprise and entertain your friends, win new popularity, earn extra money, develop hidden talent. No music or experience necessary. Business fundamentals and complete Professional Tap Dance included. Proven way to reduce. Cost money builder. For ladies or men. Send only \$2.75 money order for complete course of 17 lessons. Or Send No Money and pay postman \$2.00 on delivery except foreign. Nothing more to pay. Try 5 days. If not satisfied, money refunded. Limitless careers given FREE if you ENROLL NOW!

THORNTON DANCE STUDIOS  
2751 Midway Ave., Suite 2-50, Chicago, Ill.

## RADIO TELEVISION SOUND REPRODUCTION

World's Newest Big-Pay Big-Future Profession. Thousands of New Positions in an Uncrowded Field for Men who can Qualify. We offer Dependable Training at a Reliable School under High-Class Instructors in Complete Assembly of Up-to-the-Minute Equipment. We teach you right here in our Shop, not by Mail. Also Courses in Electricity, Automobiles and Welding.

COLEMAN ELECTRICAL SCHOOL, 1623-Z Main St., Kansas City, Mo.

## LEARN THE JEWELRY BUSINESS WATCHWORK, JEWELRY AND ENGRAVING

Send for free catalogue

Bradley Watchmaking School, Dept. P, Peoria, Illinois

## Learn Photography at HOME

Make money taking pictures. Prepare quickly during spare time. Also earn while you learn. No experience necessary. New easy method. Nothing else like it. Send at once for free book. OPPORTUNITIES IN MODERN PHOTOGRAPHY, and full particulars.

AMERICAN SCHOOL OF PHOTOGRAPHY  
Dept. 1355, 3601 Michigan Avenue Chicago, U. S. A.



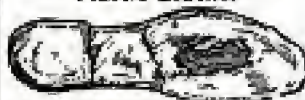
# FREE Sample SAVASOLE

Amazing "Plastic Leather"  
Invention Revolutionizes  
Shoe  
Repairs!



## SAVASOLE

The Original Perfected  
"Plastic Leather"



**BEFORE**—Here is an old shoe worn down, ready to be sent to the shoe-maker, who would charge \$1.00 to \$1.75.



**AFTER**—Here is the same shoe repaired with SAVASOLE. No hammer, nails, or glue. All the cracks and breaks are filled in and covered up with a hard, smooth, waterproof, gum-like surface. SAVASOLE repairs shoes, for one-visit shoe-maker's cost.

**Builds  
up  
Leather  
or Rubber Heels**

### I'll Help You Start

I give you unlimited cooperation. You can become my District Manager and have sub-agents of your own. And besides your liberal daily cash commissions, you can share big bonuses and extra awards! Remember, SAVASOLE is never sold in stores. Folks can buy it only from you. Only Savasole can use the genuine Bollman Double-action Cement process, on which patents have been applied for. And genuine, perfected Savasole is unconditionally guaranteed. People order and re-order it for shoes, boots, harness, rubbers, cuts in auto tires—1001 uses. Beware of imitations.

**THE PERFECT MANUFACTURING COMPANY**  
H-506 Daylight Bldg. Cincinnati, Ohio

R. R. Bollman, President  
PERFECT MFG. CO.,  
Dept. H-506 Daylight Bldg.,  
Cincinnati, Ohio

Dear Mr. Bollman: Please send me FREE sample of Savasole and details of how I can make up to \$42 a day. I am not obligated.

Mail This  
Coupon Today

Name.....

Address.....

State.....

Town.....

See For Yourself How It Puts On  
**New Soles** for as low as  
**Brings You** **9¢** A PAIR  
as high as  
**\$42. Daily Profit!**

Send No  
Money!

### Sent by Return Mail Postpaid!

I am determined to put a FREE SAMPLE OF SAVASOLE in the hands of every man and woman who is ambitious to share in Savasole's success! I want you to test for yourself this amazing discovery of mine—without a penny of cost. See how Savasole builds smooth, waterproof, leatherlike new soles on any old shoes for as little as 9¢ a pair! You will then know why city workers, farmers, housewives, everybody snaps up this perfected product which is such a blessing in hard times—why you can make so much money. Just mail the above coupon—send no money—get your FREE SAMPLE!

### What SAVASOLE Is—What It Does

Savasole is a scientific "plastic leather" invention that does away forever with costly shoe repair bills. It puts new soles on old worn out shoes. It spreads on easily with an old knife and fills in all holes, cracks and

worn spots. Let it dry over night and in the morning you have a brand new sole that is smooth, thick and waterproof; that looks and wears like leather. Rebuilds run down heels, too, and is good for repairing 1001 other articles.

### Exclusive Rights!

I'll show you how to start as my representative and immediately—without experience—earn money like Miller of Ohio. Read his story opposite. He is only one of hundreds who are making real money with SAVASOLE. I expect a flood of answers to this offer. Somebody in your town is going to get my FREE SAMPLE—start taking these big cash profits—"sew up" the exclusive selling rights! You can be that lucky representative if you act PROMPTLY. Clip, fill in and rush back the above coupon for your FREE SAMPLE and lifetime opportunity TODAY! Address me personally, R. R. Bollman, Pres.

### \$135 a Week



I gave up my former connection where I ranged in earnings from \$315 to \$380 per month. I started out with three gross of Savasole. Since that time, my earnings have netted me over

\$135 per week and I am sure that I will soon hit \$200 per week. Savasole has solved my financial problems, and you are the whitest bunch of people to work for I ever saw.  
G. C. Miller.

When writing to advertisers please mention Popular Mechanics



# \$5,000.00 in

## TWO GRAND CASH PRIZE CONTESTS...

### Contest No. 1 \$2,500.00

## For Letters Telling About The Best Money-Making Ideas Found In Popular Mechanics

(Contest Ends February 10, 1932)

### PRIZES

\$1,000.00	FIRST PRIZE
500.00	SECOND PRIZE
250.00	THIRD PRIZE
150.00	FOURTH PRIZE
100.00	FIFTH PRIZE
FIFTY	\$10.00 PRIZES

(In case of ties, duplicate prizes will be awarded)

### SAMPLE LETTER

**How Phillip Scott Found a \$1200.00 Secret in Popular Mechanics**



"Some time ago I saw an article in Popular Mechanics which illustrated and fully described some grotesque figures carved out of hardwood that would crack nuts and be useful as well as ornamental. This clever idea appealed to me at once as a real money-maker and as a friend of mine, Phillip Scott, was out of work, I showed it to him. He read the simple instructions for making these unique dolls and became enthusiastic at once. He got busy making them and has since made over \$1200 in profits by selling them to folks for household use and for gift purposes. He gets lots of orders because he is the only one who makes these figures, and as a result today has money for things he could not otherwise afford. We're both grateful to Popular Mechanics for his sake." . . . (He then states his reasons for thinking this is a good money-making idea.)—R. B. Pierce, Bookkeeper, Peoria, Illinois.

**H**OW would you like to win \$1,000.00 in real cash—just for writing a few words? This wonderful first prize and fifty-four other big cash awards totaling \$2,500.00 are waiting for readers of Popular Mechanics, in one of the most unique liberal cash prize contests ever conducted.

For many years, Popular Mechanics has been read regularly by thousands upon thousands of thinking men and women in every walk of life. Everyone has found this fascinating magazine a treasure chest of world-wide facts and money-making ideas. A steady parade of strange developments and scientific facts, gathered by our staff of 4346 correspondents from every corner of the globe, has enabled scores of wide-awake folks to turn their time into money.

No doubt you have seen many ideas in Popular Mechanics which struck you as being real money-makers. If so, you can win a big cash prize now by simply writing a short letter of 500 words or less, telling about some idea that you have found in any issue of Popular Mechanics. This may be an idea that you have seen or used yourself or simply an idea that you consider good enough to be used by somebody else.

That's all you have to do to win the \$1,000.00 first prize or one of the many other fine cash awards. What an easy way to win a nice bundle of cash to do with as you please! Remember, you have as good a chance to win as anybody. So follow the simple rules below and mail your letter before the contest ends.

### Simple Rules

1. In 500 words or less, tell about some money-making idea that you have seen in any issue of Popular Mechanics which you have used to make money or which you feel could be used by someone else for profit, and give your reason.
2. Write on one side of the paper only, either typewriter, pen and ink, or pencil.
3. Literary style and grammar will not be considered. Selections will be based on ideas and the reasons for your choice.
4. Send in as many letters as you please. Replies must be post-

marked not later than midnight, February 10, 1932.

5. Anyone can enter this contest except employees of Popular Mechanics Magazine or members of their families.

6. Five judges will decide the winners and their decisions will be considered final.

7. Your name, complete address and your occupation must be plainly given at the end of your letter.

8. All answers to this contest must be addressed to Editor, Contest Number One.

**POPULAR MECHANICS Magazine**  
200 East Ontario St. CHICAGO, ILL.

## Nothing to Buy or Sell . . . Now or Ever

When writing to advertisers please mention Popular Mechanics



# Cash Prizes

...110 BIG CASH AWARDS IN ALL

**Contest No 2 \$2500.00**

**Popular Mechanics Offers  
\$2500.00 For Practical  
Money-Making Ideas**

(*never published. 10/4/34*  
**Contest Ends February 10, 1932**)

**T**HIS contest is entirely different and separate from Contest No. 1, which is described on the opposite page. Its purpose is to reward thinking folks who send in practical money-making ideas suitable for publication in Popular Mechanics Magazine. Fifty-five big cash prizes, totaling another \$2,500.00, will be given away for the best letters—in addition to the fifty-five cash prizes offered in Contest No. 1.

Think of it! All you have to do to win a handsome cash prize in this unusual contest is to send in a short letter of 500 words or less presenting your money-making idea. It may be an idea that is already helping you or some friend of yours to make extra money. It could be something to do at home, such as canning fruits and preserves or renting rooms to tourists, or it might be something like killing animal pests for bounty.

No matter how small your idea seems to be to you, do not hesitate sending it in at once. It is the simple, practical suggestion that is likely to win the first prize of \$1,000.00. You can enter one or both of these contests and send in as many letters as you wish. Literary style or grammar is not a factor. Awards will be based on the ideas and reasons submitted. So get busy at once and send in your letters. You may be \$1,000.00 richer by next spring if you do!

## Simple Rules

1. In a letter of 500 words or less, state briefly your money-making suggestion. Your idea may be something that you or someone you know is already making money with. Or it may merely be a plan that you believe anyone can use to advantage for profit in full time or spare time.
2. Write on one side of paper only.
3. Literary style and grammar not considered. Selections based only on merits of ideas and reasons submitted.
4. Send in as many letters as you wish. Replies must be postmarked not later than midnight, February 10, 1932.
5. You can enter either or both of these contests. (Anyone is eligible to compete except employees of Popular Mechanics or members of their families.)
6. Winners of prizes in Contest No. 1 are eligible for prizes in Contest No. 2 but no one can win more than one prize in each contest.
7. Five judges will decide the winners and their decisions will be considered final.
8. Your name, complete address and your occupation must be plainly given at the bottom of your letter.
9. Replies to this contest must be addressed to Editor, Contest Number Two.

DO NOT SEND MODELS

**POPULAR MECHANICS Magazine**

200 East Ontario St.

CHICAGO, ILL.

**Nothing to Buy or Sell . . . Now or Ever**

When writing to advertisers please mention Popular Mechanics

## PRIZES

\$1,000.00.....	FIRST PRIZE
500.00.....	SECOND PRIZE
250.00.....	THIRD PRIZE
150.00.....	FOURTH PRIZE
100.00.....	FIFTH PRIZE
FIFTY \$10.00 PRIZES	

(In case of ties, duplicate prizes will be awarded)

## SAMPLE LETTER

### How "House-to-House" Gardening Brings Kolo \$35 to \$40 a Week

"Early this spring, I was laid off at the garage," writes Walter F. Kolo. "Rather than sit around idle, I decided to fix up my back yard which I had never had time to give attention to. Soon I had a beautiful lawn and lovely flowers shooting up. One day while I was sprinkling my garden, my next door neighbor, an old widower who was in ill health, offered me \$25 to fix up his garden and \$5 a week to take care of it after that. You bet I grabbed his offer. That gave me the idea to go after other neighbors and friends who either didn't have the time or weren't physically able to do this work. My plan worked out so well that now I make as high as \$45 a week and enjoy the work very much more than at the garage." (He then states his reason why he thinks this idea a good one for publication in a magazine like Popular Mechanics.) Walter F. Kolo, Mechanic, Brooklyn, N. Y.





# YOUR CHANCE FOR THRILLS... ADVENTURE... ADVANCEMENT



In aircraft radio, television, talking pictures, disc and film recording, servicing home entertainment equipment, radio compass and direction finder, broadcast station and studio... and other exciting branches of radio.

**R**ADIO is filled with possibilities no other industry possesses. But thorough training is a necessity! Without it you cannot hope to win. Here is a way you can get the training which enables you to qualify.

For the purpose of training and equipping men who have ambition and ability, RCA Institutes maintains four complete resident schools in New York, Philadelphia, Boston and Chicago...the only schools associated with the largest, most complete research laboratory in the radio industry.

These schools... alert, modern, progressive... offer elementary and advanced courses, based on 22 years' experience, in practical radio. You get a training that is unsurpassed anywhere.

## Win Radio Scholarship

If you cannot attend the resident schools, RCA Institutes Extension Courses enable you to study at home. Special home laboratory equipment furnished. All extension graduates receive two weeks' instruction at resident schools. Outstanding graduates of extension courses become eligible for free scholarship in advanced courses at nearest resident school. All tuition costs moderate. Write for general catalog, full details. Use coupon.

## RCA INSTITUTES, Inc.

RCA Institutes, Inc., Dept. MP-12, 75 Varick St., N. Y.  
Gentlemen: Please send me your General Catalog. I am checking below the phase of radio in which I am particularly interested.

- |   |   |
|---|---|
| <input type="checkbox"/> Aircraft Radio                     | <input type="checkbox"/> Disc and Film Recording                |
| <input type="checkbox"/> Broadcast Station or Studio        | <input type="checkbox"/> Servicing Home Entertainment Equipment |
| <input type="checkbox"/> Talking Pictures                   | <input type="checkbox"/> Direction Finder and Radio Compass     |
| <input type="checkbox"/> Direction Finder and Radio Compass | <input type="checkbox"/> Television                             |

Name \_\_\_\_\_

Address \_\_\_\_\_

Occupation \_\_\_\_\_ Age \_\_\_\_\_

# NEW YORK ELECTRICAL SCHOOL

## Opportunities for All Men!

Every phase of all branches of Practical Electricity taught by Actual Practice in America's Foremost Institution of Trade Learning.

Special Courses in Automobile Mechanics and Electricity.

Day and evening classes open all year.

Write for *FREE* School Booklet

**New York Electrical School**  
44 W. 17th St., New York City

## RADIO BLUEPRINTS

The blueprints below include the best of Popular Mechanics tested circuits. When ordering, simply quote the numbers of blueprints desired and inclose proper amount addressed to Popular Mechanics Magazine, Radio Dept., 200 E. Ontario St., Chicago, Ill. Magazines containing full descriptions of the circuits can be obtained. Send 25 cents for each magazine desired, giving date of publication.

No. 139, Simple Television Receiver... Dec. 1928... 25c

No. 142, Two-Tube Screen-Grid Short-Wave Adapter... Mar. 1929... 25c

No. 146, Adjustable B-Eliminator... Nov. 1929... 25c

No. 151, Beginners Low Power S-W Transmitter... June 1930... 25c

No. 152, Portable Radio Amplifier for the Deaf... July 1930... 25c

No. 153, Low Cost Code and Phone Transmitter... Sept. 1930... 25c

No. 155, Four-Tube D-X Receiver... Nov. 1930... 25c

No. 157, Building a Light-Sensitive Relay... Dec. 1930... 25c

No. 158, High-Power Supply for Amateur Transmitters... Jan. 1931... 25c

No. 159, Portable S-W Transmitter... Feb. and March 1931... 25c

No. 160, Building A.C. Midget Receiver... Mar. and Apr. 1931... 25c

No. 161, Building Auto Receiver for 2-volt Tubes... Apr. and May 1931... 25c

No. 162, Battery Eliminator for 110-volt D-C Supply... June 1931... 25c

No. 163, Two-Tube A. C. Short-Wave Receiver... June 1931... 25c

No. 165, Pre-Amplifier for Home Recording... Sept. 1931... 25c

No. 166, Building Stenotube Superheterodyne... Sept. 1931... 25c

No. 167, Building an A. C. Super Short-Wave Converter... Oct. 1931... 25c

No. 168, Television Receiver of Advanced Design... Nov. 1931... 25c

No. 169, Little Giant, Battery Receiver for 2-volt Tubes... Dec. 1931... 25c

Material lists for any of the above instruments will be mailed free upon application.



# Pick Your Own Job!

## I'll Help You to Get It

**N**O special experience required to get one of these attractive Government positions. All you need is to pass an examination—and it is easy if you prepare for it. And that's my business. For eight years I was a Secretary Examiner. Since then, during the past twenty years, I have helped thousands into well-paid Government positions, and I can help you get there too. I know *how to train you* to get highest rating in Civil Service Examinations, which will qualify you for first positions open. You get the job you're after—or it costs you nothing.

### Good Pay • Short Hours • Steady Work

Get rid of the bugaboos of hard times, strikes, layoffs, job-hunting that you must always worry about in ordinary jobs. Don't stick in the low-pay jobs that start you off in a rut and keep you there. Work for Uncle Sam in a fine position you can't lose for any religious, political or personal reasons. Here's a wonderful position you can easily get that pays you from \$1850 to \$3300 a year; where there are no strikes or lockouts, where you get vacations with pay, retirement pensions, 8-hour day, automatic yearly salary raises, unlimited opportunities for quick advancement and many other advantages you can't get anywhere else!

## FREE My New Book "How to Secure a Government Position"

If you are a citizen, eighteen to fifty, you can get the Civil Service Position you want. Write today for my new free book that tells all about the Civil Service—the jobs open, what you must do to get the job, the pay, the vacation, and all the big advantages of Government Positions. Find out just how I can help you land a steady good-paying position in the Civil Service in Washington, travelling, or near your home. Mail the coupon or a postal today.

**A. R. PATTERSON**  
Civil Service Expert

**Patterson School**  
812 Wisner Bldg., Rochester, N. Y.



When writing to advertisers please mention Popular Mechanics

### RAILWAY POSTAL CLERK

**\$1850 to \$2700 a year**

Opportunity for travel. 15 days' vacation and 10 days' sick leave with full pay. Paid all the time.

### POST OFFICE CLERK

**\$1700 to \$2100 a year**  
**Special Clerks at \$2200 to \$2300**

15 days' vacation and 10 days' sick leave every year with full pay. Eligible to promotion to higher paid positions.

### CITY MAIL CARRIER

**\$1700 to \$2100 a year**

15 days' vacation and 10 days' sick leave every year with full pay. Good chance for rapid promotion to bigger pay.

### R. F. D. MAIL CARRIER

**\$1800 to \$2300 a year**

15 days' vacation and 10 days' sick leave every year with full pay. A fine position for men in rural districts.

### INTERNAL REVENUE and CUSTOMS HOUSE POSITIONS

**\$1100, \$1680 to \$3000 a year**

### Extra Pay for Overtime

### POSTMASTER

**\$1200 to \$2500 a year**

This is a position of great importance.

### DEPARTMENTAL CLERK

**\$1440 to \$1620 a year and up to \$3000 a year**

30 days' vacation and 30 days' sick leave with full pay. Work in Washington, or near home.

### HOW TO SECURE A GOVERNMENT POSITION



**IMPORTANT**  
Get ready NOW for the NEXT Railway Postal Clerks' examination! Average yearly pay with allowances is \$2750.

**A. R. PATTERSON, Civil Service Expert**  
**PATTERSON SCHOOL**  
812 Wisner Building, Rochester, N. Y.

Please send me your big free book and tell me how I can secure a position with the U. S. Government paying me \$1,850 to \$3,300 a year, with excellent chance for rapid advancement. This doesn't cost me a penny.

NAME.....

ADDRESS.....

CITY.....STATE.....



# Follow the Direct Road to **SUCCESS**



Do you want a better position and a larger pay envelope? There is just one way to win success—be head and shoulders above your fellows by gaining a broader basic education. Mathematics is the basis of all education. Not a day passes in which you do not have to use mathematics in your work. Do you make your own calculations, or are you handicapped by your inability to do this work yourself? Here is the whole secret of success. This is why mathematics is taught in every school and college.

A thorough knowledge of it makes clear so many things which are puzzling you today.

Do not let another day pass without doing something to improve your knowledge of mathematics. But how can you obtain this knowledge? By going back to school or college, or taking an expensive correspondence course? You need do neither!

## At Last! Mathematics Self-Taught This Simple Easy Way!

Now you can take advantage of this easy method which has been worked out by an expert for those who do not wish to give the time and money required by other methods of mathematical study. A very simple and extremely interesting group of books has been prepared for you by a man who has devoted his life to teaching practical men the fundamentals of this important subject.

# MATHEMATICS

## For SELF-STUDY

By J. E. Thompson, B.S. in E.E., A.M. Dept. of Mathematics, Pratt Institute, Brooklyn

These books start right from the beginning with a review of arithmetic that gives you all special short-cuts and trick problems that save countless hours of your time and make you more valuable to yourself and your job. Then they go right into higher mathematics and show you how simple it is when an expert explains it for you. Don't let appearances fool you, mathematics is easy. You can get these books on approval and see for yourself how much enjoyment you can have while getting this valuable training and solving interesting practical problems that puzzle your friends and fellow-workers. In no time at all you will be tackling with ease the most difficult question on this subject.

### A Complete Reference Work on Mathematics in These Four Inexpensive Books

Starting from the first simple principles these interesting books take you, by easy stages, into the detailed applications of higher mathematics. Each step is clearly explained and is followed directly by sample problems.

Arithmetic for the Practical Man  
Algebra for the Practical Man  
Trigonometry for the Practical Man

Calculus for the Practical Man  
4 Vols., 1240 pages, Illustrated

### An Expert Gives You These Simplified Methods

Mr. Thompson, the author of these books, is not an ordinary teacher of mathematics. He has had many years' experience in giving students the kind of mathematical training they need in practical work. He presents each practical method and problem in the clearest and simplest way. He gets right down to the kind of information that you need in your daily work. Look up any mathematical problem that puzzles you in these books and see how quickly you get the solution.

## SEND NO MONEY

### Examine These Books for 10 Days FREE!

The coupon below brings you the four books for 10 days' free trial. After 10 days, return the books to us without obligation or send us the small down payment of \$1.65—balance in three monthly payments of \$2.00 each (5% discount for cash).

### MAIL THIS COUPON

D. VAN NOSTRAND CO., INC.,  
250 Fourth Ave., New York.

Send me MATHEMATICS FOR SELF-STUDY in 4 volumes. Within 10 days I will either return the books or send you \$1.65 as first payment and \$2.00 per month for 3 months—total \$7.65. (5% discount for cash.) (Pop. Mech. 12-31)

Name.....

Address.....

City and State.....

Business Connection.....

Reference.....

### J. T. Madden

(Dean, School of Commerce, N. Y. U.) Says: "The mastery of mathematics will prove of great practical value in this commercial age as a training in accuracy and logical reasoning."



Every Minute you Spend with these Books will pay you Big Dividends

When writing to advertisers please mention Popular Mechanics



# Classified Advertisements

## WORLD'S BEST WANT AD MEDIUM

Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance  
To be inserted under proper classification in January issue, copy should be in our office November 18th

### ADVERTISING AGENCIES

**ADVERTISE**—Bargain value—24 words in 24 representative Sunday newspapers \$15; Free assistance with your ads, sales letters, literature. Helpful Ad-Guide showing best paying newspapers, magazines, rates, mailing lists, etc., free. Chicago Union Agency, Great Northern Bldg., Chicago.

**BEFORE** Advertising get our catalog. No charge. 25 years in business. The largest classified agency in the world. Andrews Advertising Agency, 100 No. LaSalle St., Chicago, Ill.

**FREE**—New 1931 Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

**ADVERTISE** in rural weeklies. Lists free. Meyer Agency, 4112 Hartford, St. Louis, Mo.

**INCH** Display advertisement 50 months year \$24. Wood's Popular Services, Atlantic City, N. J.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

### FOR ADVERTISERS

**ADVERTISING**: 20 Words; 50 magazines 60¢; three insertions, \$1.20. Inch display, three months \$3.00; year \$24.00. Mailing Bureau, Lansdale, Calif.

**ADVERTISE** 52 Magazines, 3 months, \$5.00 Inch, 1st, special offers, free. Evans King Co., Box 6782, Wilmington, Delaware.

**24 WORDS**—70-95 Southeast weeklies, \$1.95. S. Stout, Warm Springs, Ga.

**ADVERTISE** in 250 country town newspapers 28 words, \$2. Lists free. All states. Keador, Hartford Bldg., Chicago.

### MAILING LISTS

**LADIES** Newest list. Guaranteed 1,000 names only six dollars. Cash only. Stephens Partie, 1040 South Broadway, Los Angeles, Calif.

### INFORMATION

**ANY** Questions, reliable information on business, technical or personal subjects. Ask us anything in the fields of engineering, advertising, patenting, business efficiency, finance, investing, education, travel, personal endeavor. For \$1.00 we will mail you answer covering essential points you need to know. Consolidated Services, 321 Broadway, New York City.

**QUICK** Money for smart people. Plan 100. "Money-makers." Lapers, Michigan.

**MECHANICAL**. Electrical engineering. Each question answered with necessary calculations or sketches 50¢. Box 115, West Lynn, Mass.

**WORLD** War veterans desiring information regarding employment and other benefits provided for them, write Delaplaine Service Bureau, 550 South Main, St. 139, Denver, Colo.

**RESEARCH** Department, Morris Advertising Agency, 3048 Warren St., Philadelphia. Questions; one dollar.

### SALES PROMOTION

**EXTEND** Your business activities to 2,000,000 Latin-American families. Extraordinary offer for introducing new products, personal and household utilities, novelties. Send discs for samples and full information. Agents wanted. Compania Internacional, Box 1518, San Juan, Puerto Rico.

**SALES** Letters, written—solicited—answered. Send your letter problems to C. L. Radke, Ilwaco, Wis.

### AUTOMOBILES

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**LAZY** Men wax works easier. Wonderful results. Now 40 cents prepaid. Three for dollar. Auto Tires Co., 203 Market St., Pittsburgh, Pa.

### AUTOMOBILE SUPPLIES

**BARGAINS**—Excellent reprocessed compressors, battery chargers, test benches, car washers. Terms. Trial. Write Ken's Automotive Service, Box M-1211, Troy, Ohio.

**RADIATORS**—Guaranteed. All standard makes. Save 40% to 75% buying at wholesale prices. Give models. Write for prices. Independent Radiator Co., 1119 So. Wabash, Chicago.

**WOLD** Strength of anti-freeze solution in radiator. Directions and outfit complete for 25¢. Box 163, Bedford Sta., Detroit, Mich.

**CHROMIUM** Plating powder plates iron, steel, brass, copper and nickel, without electricity or machinery. Guaranteed not to tarnish; ½ pint can \$1.50 prepaid. Gunmetal Co., Ave. J, Decatur, Ill.

**RECONDITION** Your Ford A. 4 pistons, 4 pins, 4 exhaust valves and one set of rings including 4 oil rings. Pins are fit in pistons, \$14.00 postpaid. Wm. Poon, Eaton, Ohio.

**RAIN-PAD**—Our new felt "Rain-Pad" keeps windshield and windows from being blurred by rain or snow. Every car-owner needs one. Sample 25 cents. Agents wanted. Conroy Sales, Box 287, Newark, N. J.

### AUTO SERVICE EQUIPMENT

**AUTOMOBILE** Owners send \$2.00, receive postpaid, material and instructions for making Supercharger conducting radiator mixture to carburetor. Removes hard carbon, smoother running, quicker pickup, increases mileage. Patent pending. License granted sale. John H. Effric, 227 North 26 St., Phila., Pa.

**SUBSTANTIAL** Savings—reprocessed compressors, battery chargers, test benches, car washers. Terms. Trial. Write Ken's Automotive Service, Box M-1211, Troy, Ohio.

**OWN** A Battery Charger and make big profits; buy direct from factory; fully guaranteed; literature free. Adams-Barr Corporation, Columbus, Ohio.

### MOTORCYCLES, BICYCLES AND SUPPLIES

**REBUILT** Motorcycles \$25 to \$100 easy. Tires, used tires \$2.50. New Firestone \$5. Engines for motorcycle box studs, airbrakes, boots \$15 to \$75. Forks \$3, frames \$3, cylinder \$2, saddles \$3, chain \$1.50, handle bars \$2, belts \$5, wheels \$3, side cars \$25. Bicycles \$9.50, airplane wheel \$1.00 was formerly \$2.00. Save your dollar prices. Oldest house in U. S. Send 25¢ for catalog. Price Cutter Distributor, Rochester, N. Y.

**MOTORCYCLE** Bargains, lowest prices, bargain sheet for stamp, motorcycle accessories, largest line in America, lowest prices. Largest motorcycle mail order house in the United States. Rochester Harley Davidson Corporation, 129 West Main St., Rochester, N. Y.

**HENDERSON**, Excelsior, Harley, Indian, used parts. Catalogue, mine pin 102. Baltimore, 189 N. 12th, St. Louis, Mo.

**USED** Motorcycles. Late models. Completely overhauled. Lowest prices in country. Buffalo Harley-Davidson Corp., 1460 Main St., Buffalo, N. Y.

**CLYMER** Bicycles \$22 up. Motorcycle \$39. New outboard motors \$95. Small car engines. Used motorcycles. Catalog free. Clymer, Denver, Colo.

**TYPEWRITERS**. Motorcycles, radios, \$1.99—\$24.99. Terms. Agents. Knights, 1505 Locust, St. Louis, Mo.

**SEND** 15¢ For illustrated used Motorcycle catalog. Large stock. Bargains. Indian parts. Accessories. Indian Motorcycle Sales, Kansas City, Mo.

**LOW** Prices—Special bargains in Harley-Davidson—14 models. Send 8¢ stamp for catalog. Knuth's, 2525 Fond du Lac Ave., Milwaukee, Wis.

**REPAIR** With good used parts, save 3¢ or more, state parts needed, no lists. J. B. Dahl, 3863 Archer Ave., Chicago, Ill.

### AVIATION

**ONE** Motor complete \$69-five dollars credit. Glenn Kueckel, Chazlin, Ill.

**PILOTTAGES**, New, \$5.00; used \$3.00. Glider wicker seats 85¢. Telescope machine gun sights, new, \$1.95. Stromberg carburetors, new, worth \$150.00, sacrificed \$2.95. Airplane drape, 90¢ gallon in 3. Airplane cloth 15¢ yard. Air Transport, Garden City, N. Y.

**WE** Lower airplane costs by inventing low-cost products. Send 10¢ for 1932 illustrated catalog of new ideas in lightplane motors, propellers, wheels, turnbuckles, universal fittings, plans. Bates Aero Works, 214 Stiel, Chicago. Over 25 years leading with the latest.

**USED** Airplane bargains, \$155 and up. Fisher 10¢. Federal Equipment Co., Box 211, Cincinnati, Ohio.

**WHITE** For Fix Specs—14¢ free. Contains prices on aviation equipment and interesting articles on new developments. Johnson Airplane & Supply Co., Dayton, O.

**OVER** 100 New aeronautical articles for \$1.25 postpaid. Includes helmet, goggles, turnbuckles, bolts, nuts, clevises and pins, fabric and many other useful items worth \$8.00 to anyone. Send \$1.25 for this surprise package today. Johnson Airplane & Supply Co., Dayton, Ohio.

**METAL** Tipped Honduran propellers, \$9.95; Ford's, \$12.50. Hibbs, Ft. Worth, Texas.

**SEND** 5¢ For bundle of bolts, nuts and price list on supplies. Aero Sigs, 3050 Hurlock Ave., Detroit, Mich.

**POLE** Sale! Used light planes, parts and supplies. Send four cents for list. Whites Aircraft, 17 & Crocker, Des Moines, Ia.

**ALCO** Airplane, 2 place—40X motor—\$100.00. Kenneth Ceebley, Standard, N. Y.

**NEW** Nine cylinder motor—Complete, ready to mount on iron base. Make offer. Clarence Paulsen, Hutchinson, Minnesota.

**SEND** For descriptive list of New, Rebuilt and Used Curtiss OX5 and Hispania Salsa Airplane Engines, Heckman Machine Works, 1026 W. Lake St., Chicago, Illinois.

**AIRCRAFT** Directory 60¢. Thousands surplus airplanes, motors, parts, supplies. Invaluable. Aerobuilders Service, 1305-15 So. 12th, Lincoln, Neb.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**LEARN** To fly where Lindbergh learned at this flying school with highest government approval. Airplane mechanics school connected with aircraft factory. Big opportunity—write today for complete information. Lincoln Flying School, 2002 Aircraft Building, Lincoln, Nebraska.

**BE** Sure that the motor you purchase for your light plane will fly it. Heath B-4 and Heath Henderson motors are guaranteed to fly and 7 years of constant performance prove it. For economy and reliability these motors cannot be equalled. Send 10¢ for large illustrated booklet. Heath Aircraft Corp., Dept. KP-12, Niles, Michigan.

### MODEL AIRPLANES

**MIDGET** Motored helicopter, flies straight up. Simple instructions, parts 30¢. Empirerolls, 221, Kureka, Calif.

**NEW** Catalogue free. Miniature Aircraft Corp., 82 Low Terrace, New Brighton, N. Y.

### BOATS AND LAUNCHES

**PLANS** 30 foot auxiliary cruiser, Terrapin, V-hull, sleeps 8. First installment in October issue 30¢. Free boatbuilding catalog. Budder, 15 Murray Street, New York.

**10K** Boat, sport plane propellers, cheap. Cyril Friesch, Sullivan, Wisconsin.

### MODEL BOATS

**BUILD** 30" Model steam launch for \$3. No special tools required. Hull, easy to build. Instructions, photos and 23 drawings \$1 postpaid. Homcraft Plans Co., 550 Monroe Ave., Detroit, Mich.

### CARTOONING

**CARTOONING** For profit. Illustrated, \$1.00 postpaid. Smith's Service, Waukegan, Wash.



**CARTOON** Instruction course 50c. Cartoon magazine free. Cartoon Publishers, West Springfield, Mass.

**COMIC** Sketch from your photo \$1.00. State hobby. Photo returned unimpaired. Teeboon, 209 Westland St., Rochester, N. Y.

**BOOK** OF 1500 cartoons—Priceless to students, artists, Action. Figures, pen lines, shading, etc., \$1.98. Sample page if desired. Summers, 14301 Shaw, E. Cleveland, Ohio.

#### MANUSCRIPT SERVICE

**MANUSCRIPTS** Typed and revised by experienced English teacher. Terms on request. Kate L. French, Elkhart, Louisiana.

#### ARCHERY

**ARCHERY** Tackle from the Quarks where raw material is plentiful and woodworkers exceptional. Catalog free. Outdoor Amusement Company, Clinton, Mo.

**MAKE** Your Bow and Arrows. We sell materials. Send 25c for working instructions and catalogue. Sidner Archery Co., Sidney, Ohio.

#### FOR BOYS

**EARN** Christmas money. Order 50 sets Christmas seals. Sell for 30c each. When sold returns \$1.40 keeping \$2.00. St. Nicholas Seal Company, Dept. 43-PM, Brooklyn, N. Y.

**BOY** Chemists send 10c for plan of chemically driven boat. Simms Service, Box 518, Clifton, Arizona.

#### CHALK TALKS

**LATCH** Producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

#### BOOKS AND PERIODICALS

**MIXED** Company—Book of drink recipes—Toasts—Cartoons. 25c each. Tee-Jay, 471 East 148th Street, New York.

**CARTOONING** For profit. Illustrated. \$1.00 postpaid. Smith's Service, Wenatchee, Wash.

**HYPNOTISM** Easily learned. Lessons guaranteed. Postpaid \$1.10. Smith Pub. Co., Dept. 3, Springfield, Mass.

**DEVELOP** Spirit-Radio. Read spiritual engineering. \$1.75. R. J. Strong, 1497 E. Verona, Penna.

**20c** HANDBOOKS. Trades, automobiles, etc., shorthand, 25c. Starr, 1895, Nashville, Tenn.

**LEARN** The truth. Atheism, Darwinism answered, 15c. Supplement "Debunking" Clarence Darrow, 5c. Free unemployed. Emment, 3813 Lafayette, St. Louis, Mo.

**FREE**—25 Lessons in radio, also save \$1 on two year subscription to Radio News only \$1.00. Money saving list free. Porter's Publications, 9410a - 115th St., Richmond Hill, N. Y.

#### PICTURES AND POSTCARDS

**CHRISTMAS** Cards: 8—20c; 12—30c. Marquand Publishers, Venedy, Ill.

**HIGH-GRADE** Christmas cards. 7c to box, fancy envelopes. Regular price \$1.00 per box, 45c or 3 for \$1.00. Sidner Studio, Sidney, Ohio.

**ACTION** Photos, same as imported. Box 401 Santa Ana, Calif.

#### GAMES, ENTERTAINMENTS AND PLAYS

**PLAYS**, Operettas, musical comedies and minstrel, comedy and talking songs, black-face acts, vaudeville acts, monologs, dialogues, recitations, juvenile plays and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denton & Co., 622 So. Wabash, Dept. 11, Chicago.

#### NOVELTIES, CURIOS, ETC.

**THE** Jumping Frog! It's great! 15c. Airtero, Augusta, Maine, Wisconsin.

**NEW** Unusual 50c novelty and trick. Elgin Toy, Elgin, Ill.

#### MAGIC TRICKS, BOOKS AND JOKER NOVELTIES

**MAGIC**—Tricks, Books and Supplies. For amateurs as well as the great professionals. Anyone can learn through our instructions. Feature Acts in Mind-Reading, Spiritualism, Rope Ties, etc. Large illustrated professional catalog, 20c. Chicago Magic Co., 140 So. Dearborn St., Dept. E, Chicago, Ill.

**SEVEN** Optimagical delusions. Four Magic catalog 25c. Gilmagiro, Morgan Park, Chicago.

**PERFORM** Miracles. Master card trick system. 10c including new magic catalog. Wizard Magic Company, Dept. 3-B, Box 1055, Station "C," Los Angeles, Calif.

**MAGIC** Catalog, illustrated, 10c. Spelzer Specialty Co., Box 8, Brandywine Station, Schenectady, N. Y.

**MAGIC** Catalog 20c. Lynn, 105 Beach, Dept. 3, Jersey City, N. J.

**TRICK** Catalogue, illustrated, 10c. Oaks Magical, Dept. 548, Oshkosh, Wis.

#### RADIO SETS AND SUPPLIES

**SHORT** Wave radio can make you millions. Learn. Instruction book \$3.50, television \$3.50, both \$6.50. Short wave sets only \$12.00. Tube bases for sets 3 for 50c. Latest automobile radio \$65.00. Radio questions answered 25c each. Special 25 money-earning plans \$1.00. Lester E. Day Radio Shop, 2112 Lombard, Boise, Idaho.

**EDISON** Rechargeable "D" batteries. Free literature upon request. See Jar Battery Co., 1302 Rossmore Avenue, New York City.

**MAKE** Simple crystal radio. Crystal, with instructions, 25c. Melomite, Fairmount Station, Kansas City, Mo.

**MELAMITE** Crystal radio, \$1.40. Melomite, Fairmount Station, Kansas City, Mo.

**BUILD** Your own radio-photograph. Catalog mailed for 10c. "American," 3603 Wesley, Berwyn, Ill.

**GUARANTEED** "Pocket Radio," \$2.00, Catalog, 10c. Nell Tasker, Shamokin, Pennsylvania.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

#### EXPORTS AND IMPORTS

**THE** Uebersee Post, German Importing and exporting monthly English journal offers numerous bargains in latest goods. Thousands seeking American outlet. A wonderful opportunity for obtaining any distributing agency. Subscription 1 year \$1.15. Sample copy 60c. Fred Hettick, Sec'y., Mail Order Dealers Ass'n., Bismarck, North Dakota.

#### STAMP COLLECTING

**EXCEPTIONAL** offer: Once again we demonstrate our unquestioned leadership with the following amazing offer: 10 different stamps, every one of which belongs to an early issue of the 19th century, including a 51 year old classic and a superb copy of a United States press Washington of 1857. The catalogue value of these fine old stamps is over \$1.20, but just the same we send all 10 for only 10c to approval applicants. Globus Stamp Co., 268 Fourth Ave., New York.

**INTENSE** Triangle stamp! The largest in the world, an album giant (Spain 1830 Columbus commemorative) included in amazing packet of thirty-four scarce varieties from queer far-off lands: Red, Kouang-Tehou, Guallor, etc. Absolutely no common European varieties to mar the high quality of this wonderful packet. Only 10c (coin) to approval applicants. Vogue Stamp Co., Dept. 38, Port Chester, N. Y.

**100 DIFFERENT** Foreign stamps from 100 different foreign countries, including Africa, Asia, Australia, Europe, West Indies, etc., for only 25c. Free with each order, our pamphlet telling "How to Make a Stamp Collection Properly," together with our price list of albums, supplies and hundreds of bargains in sets, packets, etc. Queen City Stamp Co., Room 36, 804 Race St., Cincinnati, Ohio.

**BIG** Parade—A packet of more than twenty all different better grade stamps showing exciting scenes and records of nations at war. Includes fire-yet hurler; the storming of a cit; hand-to-hand bayonet struggles; bloody battle scenes; troop transport; red cross stamp; dying soldier; victory stamps; etc. Send for this thrilling "Big Parade" packet at once—limited supply. Only 10c to approval applicants. W. A. Rowell, 58 Cornhill, Boston, Mass.

**THE** Biggest Dollar—1000 mixed foreign including Newfoundland, Persia, etc., for 40c; 1000 mixed U. S. for 40c; 100 different U. S. with Civil and Spanish War Revenue and old 1861 cover for 44c; 300 Latin-Americans for 25c; 100 different from 50 countries for 10c. All above with 1000 hinges for \$1.00. Approval selection with each order. New England Stamp Co., Established 1893, 53 Brumfield Street, Boston, Mass.

**PREMIUM** To approval applicants. A. Metzger, 1022 Liberty, Cincinnati, Ohio.

**SCARCE** Airmail and triangle. Beautiful Uruguay "Brins horse" airmail and scarce Guatemala triangle (smallest in the world) are included in our big packet of 60 different stamps from Antilles, Grand Lban, Venezuela, British and French Colonies, etc. All for 5c to approval applicants. Big illustrated list free with each order. Write today! Myrtle Stamp Co., (Dept. 88), Camden, New York.

**ANCHER'S** \$\$\$ Output—only 12c. Fine triangle stamps, set German stamps (newest) value millions dollars, perforation gauge and mime scale, airmail set, interesting stamp smallest republic, newspaper set, packet good stamps Transvaal, Malat, Dutch Indies, etc., fine pocket stock book. Entire outfit 15c to approval applicants. Ancher Stamp Company, Rutherford, N. J.

**SELLING** Growing stamp concern. Only those with intentions need bother to write. Everything explained and arranged. National Philatelic Supply Company, 11 528 South-east Boulevard, New York.

**PHILIPPINE** Island stamped envelopes (unreleased on U. S. issue of 1908, set of 16 varieties, entire and unused, \$1.25. Cat. 5c. \$1. Same such on U. S. issue of 1901, set 12 var. \$1. John Zug, Bowie, Maryland.

**BRUNEI** (Native scene), Tanganyika, Orange River Colony, Kenya, Foreign Revenue, Eritrea, Grenada, Syria, French Guinea (catalogue 25c), Nyasaland Protectorate, and scarce genuine Baden, all for 5c to introduce our famous approvals. Viking Stamp Co., Sheephead Bay Station, Brooklyn, N. Y.

**4 LIBERIA** 5c With approvals. Paramount Stamp Co., Yuba, Calif.

**NYASALAND** Protectorate and 25 other British Colonies 4c to approval applicants. Frank Ewing, Box 693, Cleveland, Ohio.

**FREE** Bahrain list. Stamps from Cyprus, Mayotte, Cyprus, Gold Coast, Helas, North Borneo. 100 diff. and 2 old coins all for 20c. H. Rossmiller, 626 N. 13th St., Reading, Pa.

**6 YAR.** Guinea 5c to approval applicants. T. E. Miller, 667 Linwood Ave., Columbus, Ohio.

**ABYSSINIA** To Zambesia—\$2.00 catalogue value. 34 scarce stamps, Abyssinia, Helas, Spanish Morocco, etc. Only 10c to approval applicants furnishing references. Weaver, Dept. 3, 1331 Broadway, New York.

**NICE** Approvals, references. Superior Company, 1348 St. Clair, Cleveland, Ohio.

**PACKET** Of fine stamps from United States, Canada, Newfoundland, including \$2.00 U. S. Canada Map, also commemoratives from the above countries. Only 10c to approval applicants. Jackson, Box 884, Timmins, Ont., Canada.

**COLLUSAL** Lot, containing hundreds of stamps, including such as Brunel (ranger), Red (ranger), Ceylon Islands (ranger), Madagascar (mounted soldier), Cyprus (discovered). Everything only 10c to approval applicants. Mercury Co., 1827 Amethyst St., Bronx, New York.

**PACKET** Giant stamps (including world's largest, valued 75c) only 10c to approval applicants. Gem Co., 1830 Unionsport Road, New York.

**THE** Bargain of a century. Look at these postages: Zambesia, New Guinea, Johnston, Lorenzo Marques, Ubangi, Monaco, and multitude others. Also useful gift. All only 10c to approval applicants. Goldwater, 1827 Amethyst St., Bronx, New York.

**FREE**—Borneo, commemoratives, colonies, airmails, with approvals. Reference. Brenon, 2018 6th Avenue, Brooklyn, N. Y.

**FREE**—25 French Colonies with approvals, postage 2c. Paternus Stamp Co., 5298-12th Street, N. W., Washington, D. C.

**TRIPOLI**, Tele. Tanganyika, Abyssinia, world's smallest country, etc., in packet 58 different, 5c to approval applicants. Marsh, 51 Oliver, Hartford, Conn.

**FREE** 15 Philatelic stamps. Postage 2c. P. Roberts, 601 Fourth, Bay City, Michigan.

**PAPUA** (Lakatal boat), Zanzibar, Iraq, Nyasaland, Lebanon, Siam, etc., in our wonder packet 57 different, 5c with approvals and lists. Monumental Stamps, Arlington-203, Baltimore, Md.

**ABYSSINIA** Rhino. (Catalog 45c), also packet Andorra, Olpe Gluba, Eritrea, Nigeria, Mozambique, etc., only 5c with approvals and lists. Pilgrimage Stamps, Mount Washington, Md.

**STOCKBOOK**, 25 Airmail; 15 Newfoundland; 25c. Bartles Company, Saratoga, N. Y.

**1000** NICELY Mixed stamps, 25c postpaid; 1,000 hinges 10c; 2,000, 17c. Price-lists. Sunshine Stamp Co., 649 East Maryland St., St. Paul, Minn.



**MEXICO** Current mixture, quarter pound. \$1.00. Mandell, Inc. 4711, Phila., Pa.

**SEND 25 Cents** deposit for selection stamps at one cent each. 3415, 3417 South 7th Court, Birmingham, Ala.

**150 ALL** Different de luxe high grade stamps and wholesale catalog 10c. A. McCreery Co., Chatham, Ontario.

**54 FRENCH** Colonies, Alouettes, Gabon, Caledonia, etc., with approvals 5c. Hollibock, 312 Marquette, Minneapolis.

**SELLING** Quality stamps on approvals 1/2c up. Dandy free premium. Collections and job lots bought. Kelgwin Stamp Co., Vineland, N. J.

**100 STAMPS**, Perforation gauge, hinges, 3c with approvals. John Kitchel, 5411 Stone, Cleveland, Ohio.

**FREE**—Sell foreign on commission. Get your stamps free. Good United States approvals. References. The King Company, Minneapolis, Minn.

**COLLECTORS!** For exchanging stamps, illustrated postcards with 2000 collectors. Ask American booklet 102, Registre Echangeables, 51 Passage Bureau, Paris, France.

**50% DISCOUNT** on Scott's many hard to get nineteenth century stamps. References please. Robert Dodwell, Garland St., Lynn, Mass.

**FREE** Stamps with 1000 hinges 7c. Approvals. Cosmopolitan, Racine, Wisconsin.

**PERSEA** Packet (value 40c) 10c with approvals. Lists free. Beacon Stamp Co., 2992 Beaconsfield Ave., Detroit, Michigan.

**35% CASH** Commission, no investment, selling stamps up to most expensive. Price 50% below Scott. Unsold stamps returnable. References. Lux Stamp Co., 805 Fairmount Place, New York.

**125 DIFFERENT** Stamps 8c 10c sets 75c. Postage extra. Kula, 5343 Dollett, Cleveland.

**FREE**—300 Stamps with winter's subscription. 10c. Cheapest approvals! "Stamp-let," Hamper, W. Va.

**CALCUL** Islands—Also early United States, Uganda, Lowermarques, Congo's, Salvador, Monte Carlo, Prince Islands, Canada, Channel—"Countries collectors haven't got"—Free for 3c postage. Murray's For years, now, Empire Stamp Company, Toronto, Canada.

**FREE** New air mail catalog showing all air mail stamps issued. Lowest prices. Edward Filander, 519 Second Ave., Seattle, Wash.

**BARGAINS!** 1/2 Catalog. Lists free. 5 Sarawak 10c. Sterling, Akron, Ala.

**1000 MIXED** U. S. old and new 25c. Weatherly, Lakewood, O.

**TRIANGLES**—Eight different triangle stamps including Guatemala (world's smallest), Latvia (air mail), Liberia, Nyasa, only 10c to approval applicants. Paul Reeves Stamp Co., Box 48, Astor Station, Boston.

**1000 ASSORTED** U. S. stamps, 75c. Auburn Stamp Co., Syracuse, N. Y.

**20 BRAZIL** 10c showing trains, airplanes, blacksmith, harvesting, approvals included. Mantle Stamp Company, London, Canada.

**FREE** 50 Varieties unused stamps. Postage 2c. Charles Townsend, Akron, Ohio.

**SMALLEST** Stamp in the world: largest airmail stamp; packet of British and French Colonies—all for 5c to approval applicants. Hammer Stamp Co., Box 1170, Stamford, Connecticut.

**REMARKABLE** Bargains: Alutaki, St. Kitts-Neris, Cochiti, Triangles, others; also free list. 10c to approval applicants. Beacon Stamp Co., Box 840, Fall River, Mass.

**1000 HINGES** 4c. Bargains, approvals. Illinois Stamp Co., LaGrange, Ill.

**CANADIAN** Confederation set, 5 varieties, only 10c. Rheume, 8951 Mouthier, Montreal, Canada.

**ASTONISHING** Bargains in penny approvals. Stearns, 915 Rynd, Ann Arbor, Michigan.

**FIJI**, Brunel, Airmail, Zanzibar, Tanganyika, Mauritius, Kenya, in packet 49 different "hard-to-get" stamps, 6c only to approval applicants. Greenwood Stamp Company, 528 Kenwood, Glendale, California.

**ILLUSTRATED** Bulletin. Free to collectors. 10,000 mixed foreign stamps 90c. Reimora, 30 N. La Salle, Chicago.

**FREE**—Rare 1849 French Cover to applicants for approvals. 60% discount. Charles Cleveland, 508 No. Humphrey Ave., Oak Park, Illinois.

**WONDERFUL** Packet of 40 stamps from strange countries—Fiji, Tasmania, Mozambique, Sam, etc., with smallest stamp in the world for 10c. (No Europe.) 25 Cals. 10c. Barcala Stamp Co., 2714 West 23 St., New York.

**TANGANYIKA**, Mint Triangles, etc., free; approvals. Earl Tyler, Royal Oak, Mich.

**40 DIFFERENT** Unused stamps 10c. Faulkner Stamps, 89 Faulkner, Malden, Mass.

**105 DIFFERENT**, including scarce Abyssinia, British, etc., 10c. Approvals. Ramapo Stamps, Ramsey, N. J.

**BRITISH** Colonies: 40 varieties given approval applicants. 4c postage. R. D. Davis, Silver Lake, Ind.

**5 SPAIN** Different Columbus ships 7c to approval applicants. C. A. Leeson, 240 Shebroke Blvd., Toronto 12, Canada.

**PERU**: 26 Varieties 10c to approval applicants. Allon, Angola, Ind.

**FREE**, Fine British Colonial packet, 5c postage. Lighthouse, Southsea, England.

**125 FREE**, 3c Postage. Approvals. Oak Park Stamp Co., Oak Park, Ill.

**SERVILLE** Commemorative free. 2c postage. Stanley's Stamps, Heyworth Bldg., Chicago.

**LARGEST** Stamp in the world! Rare China Wild Goose special delivery stamp (value 75c) for only 5c to approval applicants. Supply limited. Positively only one to a customer. Western Philatelists, 6921 Harper, Mkt. Chicago.

**100 DIFFERENT** Free to approval applicants, postage 3c. Norman Floyd, Norman, Okla.

**FIVE** Spanish ships 5c. Approvals. La Grange Stamp Co., La Grange, Ill.

**SEVEN** Sets! Three packets 10c. Approvals! Deering, 164 Albion, Somerville, Mass.

**NEW** Spain airmail, scarce picturing terrible fire-headed demon, also 55 different new issues from Tanganyika, Congo, Eritrea, etc. All for 5c to approval applicants. Sunflower Stamp Co., Hutchinson, Kansas.

**1000 FOREIGN** Stamps 35c. Approvals on request. Empire Stamps, 222 Fulton St., New York.

**RABOTONGA**, 15 U. S. (Air mail, commemoratives, etc.) with approvals. 14 South America—5c. Hudson Co., Plainfield, N. J.

**14 COLUMBIANS**, 70c value; 5c to approval applicants. Ideal Stamp Co., 2558 North 24th Place, Milwaukee, Wis.

**1,000 OLD** U. S. 25c to approval applicants. King Stamps, Webster Groves, Mo.

**150 DIFFERENT** Lists and approvals 10c. Owen Krause, Harbor Beach, Mich.

**FREE** Packet to approval applicants 4c postage. C. Wilson, 4216 Conn., Gary, Ind.

**BALTIC** Republic 20 different stamps only 5c to approval applicants. Matheson Stamp Co., 1638 East Fifth St., Brooklyn, N. Y.

**ALBUM**, 500 Stamps, guide, 1000 hinges, duplicate book, gauge, tons, detector, \$1.00. (Free premium.) Moore, Commerce, Darby, Pa.

**STOP!** These beauties, Sarawak, Penrhin Islands, Borneo, Triangles, etc., all for 10c to approval applicants. H. L. Hunter, Box 331, Clemons, S. C.

**25 CANADA** 5c with approvals. Pratt, Somerville, New Jersey.

**SEVENTY** Different stamps from seventy different countries, 5c to approval applicants. Barrus, Box 1054, Detroit, Mich.

**RARE** China Airmail showing airplane flying over Great Wall of China; also Yallan City stamps, Nyassa, Morocco; and 51 other fine stamps. All for 5c with request for approvals. R. G. Howard, 245 Worcester Ave., Newton, Mass.

**STAMPS**—50 Diff. No European, 10c. Album 50c, 1000 Hinges 15c, 25 diff. U. S., 25c. Price list and approvals sent with every order. C. Stegman, 5941 Cole Boulevard Ave., St. Louis, Mo.

**SIAM** Five free to approval applicants. Bernard Karch, Middle River, Maryland.

**FREE!** African airmail with approvals. Moulter, 1553 Knox, Cincinnati, Ohio.

**250 DIFFERENT** Foreign postage stamps only 10c. Schilman, Thibault, N. J.

**PACKET** 52 Different from Alaska, Lebanon, Sam, etc., also watermark detector and rare old Hawaiian stamp—all for only 5c to approval applicants. Highland Stamp Co., Newton Highlands, Mass.

**PACKET** Rare diamond shaped stamps 10c to approval applicants. J. Pawlonek, Pine Island, N. Y.

**244 DIFFERENT**, Triangle, airmail, etc., 10c. R. H. Carlin, 342 W. So. Temple, Salt Lake City, Utah.

**WHOLESALE** Catalog for dealers. Illustrated. Postage 5c. Frank Co., 5031 Quernberry, Baltimore, Md.

**145 (CHINA, Etc.)** 2c. Album (500 Illustrations) 3c. Rollard, 445 Tremont, Boston.

**FREE** 5 Different Luxembourg to approval applicants. E. D. Stamp Co., 8345 Forest Park Ave., Baltimore, Md.

**FREE**, 100 Different stamps to approval applicants. John Cooley, Fishers Island, N. Y.

**ILLUSTRATED** United States list, price 50c, large complete United States price list, 1932, free. Stanley Gibbons, 387 Park Row, N. Y.

**240 DIFFERENT** Stamps 25c; 600 50c; 1,100, \$1; 2,000, \$3. Fred Onken, 629 70th St., Brooklyn, N. Y.

**25 UNITED** States, commemorative; Albania, scarce; etc., 5c. Approvals. Dennis, 1763 Logan, Detroit.

**PENNY** Approvals, 5,000 Sudan, Comoro, Nyassa, Liberia, etc. Also 14,000 averaging 14c. Philatelic Exchange, Washington, W. Va.

**STAMPS**, Sent on approval at 50% discount. Fred Herzberg, 247 So. Washington St., Wheaton, Ill.

**FREE** Stamp packet, including Argentine, Brazil, etc. Send postage. H. Buchholz, Norwood, Ohio.

**STOP!**—Look!—5 different complete sets rare old South American envelope stamps, just enclose 10c requesting unusual approvals. Bargain Stamp Service, 1332 South Hope Street, Los Angeles, California.

**EXCELLENT** Mixture 2000 stamps. Large variety including Africa, Asia, Latin America, etc. Price only \$1.00. Longacre Shop, 105 West 42 St., New York, N. Y.

**BEST** One cent approvals in America. F. Hand, 1117 So. 48th St., Philadelphia.

**FREE** Packet, wholesale list and approvals. Hugt, Box No. 597, Lowell, Mass.

**"ARTISTIC"** Packet—Beautiful airmail, Liberia pictorials, animals, War, Victory, Commemoratives, 40 others, 10c, with choice approvals. Rosedale Stamp Company, Box 1735, Winnipeg, Canada.

**RURKA** Mixture. What is it? Write. Ask. Box 1089, Vancouver, Canada.

**ATTRACTIVE** Approvals, United States, etc. Neuman Stamp Co., 212 East 23rd Street, New York.

**50 DIFF.** United States, lists and approvals, 12c. Robert Hayes, Palm Place, Toledo, Ohio.

**40 DIFFERENT** United States 12c. 60% approvals. Seidenberg, Hamda, Mich.

**FREE** Stamp collection—contains Salvador, Turkey, Africa, etc., 2c postage, 10 different triangles 25c, 1000 hinges 7c, Scott's 1932 catalogue, \$1.55. Approvals sent. Tatham Stamps, West Springfield, Mass.

**FREE!** Loose leaf postage stamp album at rate of 8 pages each month given with subscription to monthly journal. Send 2c stamp for prospectus. United Stamp Co., Marquette Bldg., Chicago, Ill.

**541 DIFFERENT** 10c To approval applicants only. Free list of bargain packets. Kansas City Stamp Co., Lee Bldg., Kansas City, Mo.

**150 GOOD** Mixed foreign stamps, 3c. Stanton, East Lima, Conn.

**500 DIFFERENT** Stamps for 25c. Big collection including Armenia, Andorra, Plume, Spanish Morocco, Kenya, Liberia, Menel, Nigeria, Quilmane, Syria, Victoria, Vatican City and other hard-to-get countries. Catalogue value over \$10.00. Price only 25c to approval applicants. Illustrated lists free. Loma Stamp Company, 4231 42nd St., San Diego, Calif.

**FREE**—\$1.00 U. S. postage Lincoln memorial free. If you write for our 50 page price-list of U. S. and foreign stamps, 2,000 illustrations and fine stamps on approval. Neuman Stamp Co., 620-J Olive St., St. Louis, Mo.

**24 VARIETIES** Cuban stamps, 10 cents. List of stamps free. Chambers Stamp Co., 111E, Nassau, New York City, N. Y.

**ONLY** 5c. 35 Different stamps including scarce Latvian triangular airmail stamps, 10 airmail, 12 United States (early issues, commemoratives, etc.) and 10 Canada. Approvals and illustrated price-list sent with each order. Curhan Stamp Company, Gloucester, Mass.

**WHOLESALE** Catalog for dealers; 4c postage. Grossman, 102 W. 42nd, New York.

**STAMPS** Sent on approval at 75% discount. Reference required. Emory Renall, Hamner, Pa.

**200 DIFFERENT** 10c, 25 Japan 10c. 60% discount approvals. Covert Stamp, 39 State, Rochester, N. Y.

**WHOLESALE** Price lists free on application. Midland Stamps, Toronto, Canada.

**FREE** Outfit! 52 stamps, hinges, pocket wallet, Postage 4c. Approvals. United Philatelists, South Berkeley, Calif.

**300 DIFFERENT** Stamps 15c. Michael, 412 So. 23rd, Baltimore, Ill.



100 DIFFERENT U. S. 30c-50c, 15c. Harkness Stamp Co., Cedar Rapids, 30, Ia.

**BOYS Wanted**—Everywhere. Show our big bargain stamp assortments to friends. We trust you and pay you splendid cash commissions. Fast sellers. Earn money with our new plan. Daily free premium if you write us at once. Lefroy Stamp Co., 626 W. Jackson Blvd., Chicago, Ill.

**CANADA** Airmail stamp free if you ask for airmails and send 15c for 25 different airmails or 30 different Canada; both airmails only 25c. We list 350 countries in our dime packets. Lists free. Special bargains, 500 different, 25c; 1,000 different, 75c; 2,000 different, \$2.50. Victoria Stamp Co., London, 4, Ontario, Canada.

#### RARE COINS

**AMERICAN** 3c Nickel, 3 crisp notes and catalog 10c. George Best, Cedar Rapids, Ia.

**FOREIGN** Nickel and copper coin, 3 crisp notes and catalog 10c. M. Figg, Box 283, Cedar Rapids, Iowa.

**OLD Money** wanted. Do you know that coin collectors pay up to \$100.00 for certain U. S. coins? And high premiums for all rare coins? We buy all kinds. Send to for large coin folder. May mean much profit to you. Numismatic Co., Dept. H. F. Worth, Tex.

**PAPER MONEY**—100 Different Confederate notes, Mexico, etc., \$1.00. Stamp and coin approvals sent. Tatham Stamps, West Springfield, Mass.

**COINS** and bills, 25 different, 25c; 52 different, 50c. Bishop, No. Kansas City, Mo.

**COINS**, Roman 2c; Norway 10c. Bollo Gilmer, 1213 Sheridan, Chicago.

**100 FOREIGN** Coins \$1.00, 10 historical medals 50c, 10 large cents 25c, 10 foreign bills 25c, 10 Confederate bills 50c, 10 arrowheads 50c, Roosevelt medals 25c. Nagy, 8 South 18th, Philadelphia.

**50 COINS** 25c, 50 Coins 50c. Odehson, Box 681, Kansas City, Mo.

**SEND 10c** For 5 different coins and catalog or 50c for 25 different. Treger Coin Co., La Fontaine, Ind.

**20 COINS** 50c. Price list 5c. Lloyd, 1821 Main, Dallas, Tex.

**5 BILLS**, 10 Coins—nickel, copper, aluminum 25c. Paul Summers, Saarborn, Tex.

**UNITED STATES** white cent and bargain selling price list 10c. Aray, Box 483, Muskegon, Ohio.

**OLD Coins** for sale—Old coin and selling prices—list 10c. Wiseman, Box 665, Huntington, W. Va.

**7 DIFFERENT** Coins, 11 bills and catalog, 25c. Crowder's, 1112 Somerset, Baltimore, Maryland.

**2 COINS**, 5 Notes and catalogue 10c. Lester White, Box 66, West Newton, Mass.

**RARE** United States and foreign coins, war medals and decorations. Selling catalogue, 10c. Alexis Menzies, Colorado Springs, Colorado.

**\$5 TO \$500** Each paid for old coins. Many very valuable. Keep all old money. Get posted. Send 10 cents for illustrated coin value book, 42c. Guaranteed prices. We buy and sell. Coin Exchange, Box 6, Le Roy, N. Y.

**GUIDE** To the value of all rare United States and early American coins, superbly illustrated. Price 5c cents. Descriptive circular free. Scott Stamp and Coin Co., 1 West 47th St., New York, N. Y.

**GET Profit** and pleasure in collecting old coins. Send 10c for large illustrated coin catalog. You'll be delighted with it. Send for it right now. R. Max Mehl, Numismatist, Mehl Bldg., Dept. P. Fort Worth, Tex. Largest Rare Coin Firm in the U. S.

**CALIFORNIA Gold**—Quarter size, 27c; 1/4 size 33c; 3c piece and catalog, 10c. Norman Shultz, Box 746, Salt Lake, Utah.

**OLD Coins**, large full selling catalog of coins for sale, free to collectors only. Catalog outlining prices paid for coins, 10c cents. William Heston, 101A Tremont St., Boston, Mass.

**UNITED STATES**, Large cent, two-cent bronze, three-cent nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George Coffin, Greenwood Mountain, Mo.

#### CAMERAS AND PHOTO SUPPLIES

**PRINTING**, 3A-4c; smaller, 3c. Developing, 10c. Photo Works, Ashdon, Ill.

**BEAUTIFUL** \$3.10 Enlargement 50c. Send your best negative now. Bill's Photo Studio, Meadco, Pa.

**DETECTIVE** Camera, the famous Hinde "Luxe" watch (new) with one roll of film taking 20 pictures \$2.95, view finder \$0.85 extra. Take pictures without being seen. Write for our free bargain book listing used bargains such as: 2 1/2" 3 1/2" Leicalette "C" with Tessar f:3.5 lens \$29.50, Eastman Kodak 3 1/2" x 4 1/2" with f:6.3 lens \$11.75, 3 1/2" x 4 1/2" Graflex with Tessar f:3.5 lens \$44.50, or a brand new 1A Harkness roll film with double lens \$4.25. All sold on ten days trial. Central Camera Co., Dept. P.M.-12a, 230 South Wabash Ave., Chicago, Ill.

**FILMS** Developed—Free enlargement. Seven high-class prints, 25c each. Club Photo Service, La Crosse, Wis.

**100 PHOTOGRAPHIC** Cards from any negative \$3.00; from photo \$1.50. Tuccollet Bros., Middletown, N. Y.

**5x7 ENLARGEMENT**—Send negative and 25c. Negatives safely returned. Frey's Photo Finishing, 700 High St., Newark, N. J.

**KODAK** Films developed 5c roll, prints 2c each. Trial offer. Photo Christmas greeting card from any negative 10c. Beautiful 10-inch enlargement 25c. Young Photo Service, 405 Brotha St., Albany, N. Y.

**MAKE** Money in photography. Learn quickly at home, spare or full time. New plan. Nothing like it. Experience unnecessary. American School of Photography, Dept. 3432, 3601 Michigan Ave., Chicago.

**HAVE** You a camera? Write for free sample of our big magazine, showing how to make better pictures and earn money. American Photography, 114 Camera House, Boston, 17, Mass.

**YOUR** Favorite Kodak picture enlarged, size 5x7, 10c. Three for quarter, coin. Send best negative (film) today. Address Farmer Photo Lab., 221 Securities Bldg., New Orleans, La.

**SPECIAL** Trial offer: Developing any size roll 3 cents; prints 3 cents each. Beautiful 7 inch enlargement 20 cents. Send for special bargain list. Rossmore Photo Finishing Company, 230 Bell Avenue, Roanoke, Virginia.

#### MOTION PICTURES AND SOUND EQUIPMENT

**JUST** Out! Race will mail postpaid Cine Amateur. Complete Handbook of motion picture photography for the amateur. \$1.00. Voice of the Films, a complete description of the process used in making sound motion pictures just out. Price postpaid, \$1.00. Motion Pictures With Sound by James Cameron. 400 pages crammed with information on all systems. \$3.00 postpaid. Bass Bar-camera No. 207 listing red hot bargains in standard and 16mm. motion picture cameras, projectors and accessories, 4c stamps. Bass Camera Company, Motion Picture Headquarters, 170 West Madison St., Chicago, Illinois.

**\$1,250** FOR Original photo-story. Our sales department sold unknown author's first story for above amount. We review copyright and submit to studios stories for talking pictures. Being located in the heart of motion picture industry we know production requirements. Established 1917. Free booklet. Universal Scenario Company, 205 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

**DE VRY** G 200 Watt bulb, list \$83. Our price including one hundred Chaplin film 16mm. \$40. Eastman reversible panchromatic 160 foot negative \$1.50. Milton Mendelager, 192 Ave. E. Racine, N. J.

**GOOD** Reel film \$1.50—500 feet \$1.00. Lowell Films, Allentown, Pa.

**SUPER-SPEED** Panchromatic 16mm. negative, including processing, 100 ft., \$6.50; panchromatic negative including developing and printing, 15mm., \$3.95; 35mm., \$6.05. Movie cameras, projectors, films, etc., bought-exchanged-sold. Lists free. Zehrbach, P. O. Box 208ST, Atlanta, Georgia.

**16mm-35mm** NEW. Used equipment. (1932) films. Stamp Bldg. booklet "Ret-for-Mexico." 16mm products. Lynwood, California.

**WHY** Pay express charges extra? Our films postpaid. Buy from Chicago Film Dealer 6801 South Carpenter, Chicago.

**SAVE** Money. Movie camera \$25, projector \$25, strengthening \$25, 100 foot 16M Eastman negative \$1.50, 35M negative 2c foot, Kodak \$5.00, typewriter \$10, cameras and films bought and exchanged. C. F. Ray, 820 - 8th Ave., New York.

**500 FEET** 9c, odd reels \$1.25, plus postage. Lists. Hoffman Film Service, 57 Broad, Albany, N. Y.

**TAKE** Your own movies with Pathé cameras, special offer \$9.85 complete; electric projector \$6.49, film \$1.49, loaded screen \$1.95. Mogul Bros., 1004 Boston Road, New York City.

**AT Sacrifice**—Motor and hand drive 35 m.m. and 16 m.m. projectors. 16 m.m. film 2c foot. Thousand foot 35 m.m. reels \$2.50. Cinema Broker, Box 524, Cincinnati.

**FILMS** 8cc 100-Ft. list. Edgar Film Supply, Westville, Mass.

**MOVIE** cameras and projectors. For homes, schools, churches, business organizations. Literature free. D. F. Elder Company, Dept. C. Chelsea, Massachusetts.

**TALKIE** And movie producers are clamoring for new short story ideas, plots, etc. Perhaps you can write one that we can shape and sell for you. One writer (V.M.) received \$3,000. New York best market. Write now for free booklet, without obligation—How To Write For the Talkies! Daniel O'Malley Company Inc., Suite P. 1776 Broadway, New York.

**1,000 FEET** Standard size film \$4.00. No lists. Sunset Film Exchange, 298 Turk Street, San Francisco, Calif.

**GET** Our big lists 16mm., 35mm. films. Easton Films, Galesburg, Illinois.

**WORLD'S** Greatest "Passion Play" 16 MM. (new) 5 reels. Rent or purchase. Write Hemenway Film Co., 37 Church Street, Boston, Mass.

**COMEDIES**, Westerns \$2.50. Power's projector \$15.00. Marshall Films, Rome, Georgia.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

#### TRADE AND TECHNICAL SCHOOLS

**LEARN** Watch repairing. Hiles School, 5230 Mission St., San Francisco.

**LEARN** Blue print reading. State your trade. Carroll Ramsey, Drangel Building, Philadelphia.

**LAYOUTS** For advertising is a useful handbook of 700 layout suggestions used in magazines, newspapers, booklets, folders, broadsides, letterheads and posters. Will save immense amount of time of any advertising man. Delivered to your door C. O. D. Simply pay postman \$3 and postage. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

#### TELEGRAPHY

**LEARN** Wireless (Radio) and Morse Telegraphy. School, oldest, largest; endorsed by telegraph, radio and government officials. Expenses low—can earn part. Catalog free. Dodge's Institute, H Street, Valparaiso, Ind.

#### BUSINESS OPPORTUNITIES

**THE** Plaster Industry needs manufacturers on small scale and for big production of Art Goods, Novelties, Souvenirs, etc., in Plaster and Marble Imitation. Experience unnecessary. 3c material makes \$1 articles. Rubber moulds furnished for speed production. We place orders and buy goods. Small investment brings big returns. Interesting booklet mailed free. Plaster Industries, Dept. A, 1835 Washington Avenue, New York.

**SELLING** Growing stamp concern. Only those with intentions need bother to write. Everything explained and arranged. National Philatelic Supply Company, 8926 Southern Boulevard, New York.

**MONEY**, big money. Men specialize in correcting automobile shims, hard steering, tire wear. Possibilities unlimited with Bear System. Get into wheel alignment game. Home study course (delicately \$10) now \$2 from manufacturers. Bear Manufacturing Co., Dept. A, Rock Island, Illinois.

**"SCHEMER"** 32p Monthly, prints big 2-getting schemes, ideas, formulas, subscriber reports \$10,000 from one copy; another \$25,000 from three. Try your luck! Three copies only 25c; twelve, \$1.00. Paterson, Publisher, Alliance, Ohio.

**WHOLESALE** Prices on plastic leather, resoling compound and other fast selling specialties. Sole-Saver, Box 682, Honda, Calif.

**MAKE** Artificial marble, colorful glossy tiles, no polishing; rather uncaner. Novelties, tabletops, bookends, boxes, whetstones. Hard, inexpensive, fireproof, enamel wood. Foiled cement methods. Amazing samples 2c. John A. Paxon, 945 Grande Vista Drive, Los Angeles, Calif.

**INSTALL** "Muejlers" wallite coin-operated miniature pool table in stores, hotels, homes, etc. A real money getter. Send for pamphlet. Steve Mueller, Arcadia, Mo.

**MAKE** Money manufacturing building material. Marble, Granite, Fireproof Paint, Flooring, Roofing. No machinery, cheap, big profits; formulas, latest methods. Wm. Lang, 443 1/2 Washington, Portland, Ore.



**AMAZING** Profits in the mail order business. Send no money, particulars free. Very little capital required. Size of city you live in has no bearing on your success in this business. Thousands now making big profits. Mutual Thrift Club, 547 Plymouth Bldg., Minneapolis, Minn.

**START** Your own business. Make big profits weekly. Mr. "Business Secrets" fully explain 10 guaranteed successful plans. Complete, \$1.00, postpaid. Particulars free. A. Norden, 492 Cherry St., Phila., Pa.

**BIG** Money—25 unequalled money making plans. 25c. Bartolo's Agency, GPO Box 46, New York City.

**250 GUARANTEED** Money-makers. Manufacture and market your own products. Catalogue 10 cents. Naurac, 3475 St. Lawrence Blvd., Montreal, Canada.

**SIGNS** And showcards easily painted. If you use Letter Patterns. Write for free samples. John Rahn, G2120 Nova Ave., Chicago.

**ARE** You old at forty? See our advertisement on page 50 of this issue. The Electro Thermal Company, 2193 Morris Ave., Steubenville, Ohio.

**BIG** Weekly profits—small capital. Great Houghton method. Particulars free. Evans King Co., 672P, Wilmington, Dela.

**\$105.00 PROFIT** in four days—There's real money making banners with the "Signograph." (Average town good for \$100.00, 1,000% profit. No canvassing. Enclose three red stamps. Arrow Signs, Hutchinson, Minn.

**START** Merchandise vending machine business—small investment—pleasant, clean-out outdoor work covering your own neighborhood. We manufacture machines—have helped others and will help you to succeed. International, 461 West 31st Street, New York.

**BETTER** Than a job. Fascinating money-making opportunities. Particulars, 2c stamp. Economy Sales Co., Dept. P., Manchester, Iowa.

**IODINE** Stain remover. Harmless. Speedy. Enough remover for 50 stains, with formula for \$1.00. Ridge Sales, LaPorte, Indiana.

**BOOK** 500 Formulas, money-making secrets, directory 300,000 articles wholesale and cover money-making formulas 25c. A. McCreary, Chatham, Ontario.

**LEARN** To make men's ties. Pattern, complete instructions. No canvassing. Send \$1.00, 350 Montgomery Street, Portland, Oregon.

**"TIMELY** Time" money-making plans! Opportunities! Three sample copies 10c. Elite Magazines, 1821 East 101st, Cleveland, Ohio.

**DOUBLE** Your income. Make ornamental products. Sell ten times cost. Used everywhere. Modest capital starts you. Complete information free. Colomare Industries, Holland, Mich., Dept. D.

**EARN** Large income with "chato" of peanut-chewing gum vending machines. Start small capital. Particulars free. Holdings Corp., DeKalb and Broadway, Brooklyn, New York.

**"START** Home-made sausage business!" Big profits. Permanent future! Write—Box 1212-B, Detroit, Michigan.

**SCREW-DRILLING** Screw drivers! Not magnetic. Remore, hold, insert screws in accessible places! Factories, garages, electricians, carpenters, mechanics, radio owners, buy on stock! Free trial! Miller, 5018 Winthrop Bldg., Boston.

**AGENTS** Manufacture own beauty preparations. Complete instructions and formulas \$1. Crown Supply, Bx. 241, Ottumwa, Iowa.

**OPPORTUNITY** Own your business, pleasant, legitimate, permanent, particulars, 2c stamp. E. H. Spencer Co. 741 Broadway, Newburgh, N. Y.

**MAKE** Big money. Manufacture—sell your own extracts, candles, soaps, perfumes, etc. Free booklet. Truax Laboratories, 1333 Walton St., Chicago.

**OWN** Your own business. Our successful business plans, which we sell at sensible prices, show you how to build a profitable spare-time business. Bishop, 603 Lulu, Kalamazoo, Mich.

**10 WORTH** For a dime! Impossible! No. 481 To get 10,000 names for our mailing list, we're giving 60 valuable information items and four money-making plans. Mighty big dime's worth, but it's yours if you want it. Southern Sales Co., Box 774-SLS, Ft. Worth, Texas.

**"START** Home-made candy business!" Big profits! Permanent future! Write—Box 1212-B, Detroit, Michigan.

**MIRRORS** Heat-treated at home. Costs near 1 cent per square foot, you charge 15 cents. Profitable business selling like new heavy, warm-off mirrors, reflectors, table-mirrors, stoves, etc. Details furnished. Details free. Sprinkle, Plater, 127, Marlon, Ind.

**MAIL** Order business fascinating and profitable. Many earn thousands yearly. Begin small. No canvassing, no personal contact. Inside pointers from 30 years experience. Send quarter for book, also batch of mail order information. J. Brender, 217 S. 21st, Philadelphia.

**FORMULAS** Beverages, syrups, extracts, flavors. Manufacturing everything. Valuable information free. The Formula Co., 6th Ave. and Broad, Seattle, Wash.

**FURNITURE** Refinishing; job painting; housework shop. Start yours on nearly nothing; mostly all profit. John Braceland, 1458 South Ninth, Philadelphia, Pa.

**WHOLESALE** Directory 300,000 articles 10c. Other valuable information. Moran Company, Wareham, Massachusetts.

**A BUSINESS** Of your own making—Sparkling Glass Name and Number plates, checkbooks, signs. The book and sample free. E. Palmer, 519, Wexler, Ohio.

**LEARN** Marbleizing with cement; make garden furniture, artificial marble, statues, etc. Inexpensive sanitary floors. Veneer any concrete products, and wood. Enamel walls or anything. Glossy, flintlike hardness. Unlimited uses for this new industry. Plans bring samples. Cowell Institute, Gratiot, Mich.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1934 W. Broad, Richmond, Va.

**FIFTY** Successful mail-order propositions. Address, R. House, 5919 Metropolitan, Cincinnati, Ohio.

**POP-CORN** Machines \$15 up. Money makers. Northside Co., 1396 Fifth, Des Moines, Iowa.

**SUCCESS** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Expert analytical service. Catalog free. B. Thaxley Co., Washington, D. C.

**SELL** By mail. Books, novelties, bargains! Large profits. Particulars free. B. Elfr, 325 S. Dearborn, Chicago.

**ARTIFICIAL** Marble sanitary flooring, instructions covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost. Ornamental casting, concrete plaster paper-marble decorations, garden furniture, statues, desirable models, particulars and illustrations free. Chris. Mahler, Elmont, N. Y.

**LEARN** The collection business. Good income, quick results. Interesting booklet. "Skillful Collecting" free. National Collector's Assn., Long St., Newark, Ohio.

**AMATEUR** Cartoonists: Sell your work. Write Smith's Service, PW1194, Wenzel, Wash.

**OPERATE** Chain of restline and amusement machines. Be independent for life. Start small, area big. P. Goodrich, 1820 East Main Street, Rochester, N. Y.

**CHEMICAL** Expert will furnish formulas and trade secrets. All lines. Lists free. W. L. Cummings, Ph. D., 328 Gordon Ave., Syracuse, N. Y.

**CHARTERS** Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

**I MADE** \$30 A week home. French breadmaking. 15 years' experience; free booklet tells. Ashbrook St., Marston, Ohio.

**BIG** Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N, Decatur, Ill.

**FREE** Booklet describes 67 plans for making \$20-\$100 weekly in home or office business of your own. Elite Co., 84 Elizabeth St., New York.

**UNUSUAL**—Common specialties always sell best. Make these yourself from Miller's guaranteed formulas. Why work for others when others can be working for you? Latest eye-opening literature brings you many specialty propositions for you an independent business. Miller Chemical, 146-K Chemical Bldg., Tampa, Fla.

**THAXLEY** Formulas produce perfect products. All lines. Catalog free. B. Thaxley Co., Washington, D. C.

**10,000 MONEY-MAKING** Formulas. Tells you how to make and sell almost everything under the sun; cosmetics, moustige, anti-trease solutions, battery solutions, bar-soaps, cheese, chewing gum, cleaning preparations, extracts, hair preparations, inks, bluing, leather polishes, mirrors, perfumes, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send no money. Just write a postal for "Miller's 20th Century Book of Formulas." Pay postman postage and \$4. Popular Mechanics Press, 290 E. Ontario St., Room 802, Chicago.

#### FORMULAS AND TRADE SECRETS

**NEW** Industries created with Liquid Marble, a dry composition powder, mixed with water. Cost 50 cents per gallon. When brushed or sprayed over concrete products, wood, wallboard, metal, etc., produces flintlike hardness, imitates beautiful polished marble, all colors and veining or mottled, perfect for decorators and art finishers. Unsurpassed, everlasting, wonderful specialties, get in on the ground floor. Send dime for samples and get our special offer. Marbleite Co., Gratiot, Mich.

**GUARANTEED** Formulas, recipes, processes, 50c each. Catalogue free. Industrial Institute, Dept. 212, 64 West Randolph, Chicago.

**THIRTY** Valuable successful formulas 25c. Leonard Chemicals, 3000 Fifth, Chicago.

**YEAST** For health, rich in vitamins, costs practically nothing to make. Guaranteed formula \$1. Box 13, Covington, Tenn.

**FIFTY** Successful formulas for 25c. Formulas, Box 391, Toledo, Ohio.

**FORMULAS** All beverages, syrups, flavors, extracts, Manufacturing everything. Interesting valuable information free. The Formula Co., 6th Ave. and Broad, Seattle, Wash.

**NEW** Formula for making skin beautifier cream. Never been used before. Proven and guaranteed \$1.00. W. M. Murray, 378 Cumberland St., Brooklyn, N. Y.

**FREE** Formula catalog describing all lines. Western Chemical, Salem, Oregon.

**LIQUID** Mosaic, New directory, mounds, solders without heat. Water-proof. Formula \$1.00. Ralph Brooks, Arkansaw, Wis.

**SPECIALIZED** Individual formula services \$1.00 each. Guaranteed. Sinton Laboratories, 2124 Griffin Street, Philadelphia, Pa.

**MAKE** Your own job. Guaranteed winning formulas \$1.00. Fast selling articles analyzed \$3.00. Write. Associated Chemists, Indianapolis, Indiana.

**FORMULAS**—Our literature will surprise you. Belfor, 4442 N. Keele, Chicago.

**TREMENDOUS** Profits manufacturing mach-ant powder, fly spray, disinfectants, insecticides, cleaning preparations. Send 10c get formula catalog and one formula with full directions. Furman Company, Kerrville, Texas.

**FORMULAS**! Latest, best, selected sellers. List free. Perlan Laboratories, Bay City, Mich.

**NEWEST** Formulas. Tested, guaranteed. Catalog free. Imperial Laboratories, 333-Marquette, Ill.

**1,000,000 FORMULAS**, Industrial facts, tables, processes, rules, trade secrets, and calculations for all kinds of Trades and Industries. Book—"More's Assistant"—1076 pages. Sent postpaid for \$2.00. Griffin Publishing Co., 57 Hove St., Dept. 22, New York.

**SUCCESS** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Expert analytical service. Catalog free. B. Thaxley Co., Washington, D. C.

**FORMULAS** All kinds. Catalog free. Claver Laboratories (P), Park Ridge, Ill.

**FREE** Formulas—Free materials making \$32.00 worth of guaranteed highest class specialty-necessities. Thirty-day unequalled unsatisfactory offers explains all. Miller, Chemist, 1707-G Jettan, Tampa, Fla.

**500 FORMULAS** and big illustrated catalog 25c. Ideal Book Shop, Park Ridge, Ill.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1934W, Broad, Richmond, Va.

#### CHEMISTRY

**BECOME** Trained chemist. Thousands of opportunities—fascinating career. Learn at home. Complete experimental laboratory outfit given. Write for big free book. Chemical Institute, 18 Park Place, Dept. P-1231, New York.



**AMATEUR Chemists:** Join the Amateur Chemists Society. 10,000 word non-technical bulletin issued weekly. 10c for sample copy and particulars. 322 N. Syracuse, Lansing, Mich.

**1932 CATALOG 10c.** General Chemical Company, Reading, Pa.

**CATALOG** Having 2,500 Illustrations chemists' supplies, 5,000 chemical, 1,000 scientific books sent for 50c. Laboratory Materials Company, 843 E. 11st St., Chicago, Ill.

**HANDBOOK For Chemical Experimenters.** Illustrated 50c. Experiment booklet 15c. Chemical catalogue 10c. General Chemical Company, Reading, Pa.

**15,000 PROFIT Making formulas.** Following and many others: Accidents and emergencies, agriculture, alloys and amalgams, artist's materials, beverages, cosmetics, glues, pastes, marbles, bleaching, renovating, coloring metals, dyeing glass, heat treatment of metals, household formulas, live steam, confectionery, chewing gum, lapidary work, exterminating vermin, lubricants, paints, varnishes, photography, condiments, tanning formulas, rubber, soap, candles, soldering, toilet preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book pay \$5.50 and postal charges. Popular Mechanics Press, Room 302, 200 E. Ontario St., Chicago, Ill.

### AGENTS WANTED

**I START** Men in a grocery business a new easy way. You use up money. Don't need to put up a penny of your own cash for stock. Expansion program now opens up many desirable opportunities also established trade. Hustlers make good money from the start increasing rapidly as they learn the business. Not a "chain" proposition but your own business. Buy on credit. Give credit if you wish. If honest and need more money write at once for application and details to McCosken & Co., Room L-6612, Wisconsin, Minn.

**AGENTS** Everywhere making money selling **Kuudy Look**, a simple invention for keeping shirts down and trousers up. They do away with unsightly bulge of shirt over a man's belt line. Every well dressed man a prospect. They cost \$1.50 a dozen. You get 25 cents each. Send \$1.50 for sample dozen, start taking orders. Big earnings sure. Reynolds Specialty Company, 121-02 Hillside Avenue, Richmond Hill, N. Y.

**JUST Invented—New oil burner.** Fits in any stove or furnace. Burns cheap oil. Fully guaranteed; 100% profit. Free sample and protected territory. International Oil Heating Company, Dept. C-1, St. Louis, Mo.

**MAGICLOTH** Polishes all metals. 500% profit. Everywhere bugs. Sample free. Magicloth, 7502 Washington, Kansas City, Mo.

**"THERE'S A kink in every kink!"** Tin of "Buns-Butter Toffee" contains "real stuff" Imported from Canadian Government permit 37-21-00523 Salesmen!! Does it sell? Air-mail for particulars! Sales-kits free! Salesmanagers. K-4393.

**SELECTED** Paper shell peaches, 5 lbs.—\$2.50, prepaid. Sellers wanted. Yacker Pear Orchard, 411 Columbia, Houston, Tex.

**BRAND New Idea.** Quick money for you. Experience unnecessary. (Join free.) Hurry! Write P-4, 1351 Dale, St. Louis, Mo.

**PROFITS** In patented product? Make. sell needy automobile accessories! Louis Martinek, Corona, New York.

**NEW** Box, held in hand, wags tail. Two mailed 25c. D. Craig, 137 Washington, Rochester, Pa.

**100% PROFIT** In new mystery cigar lighter. No heat or friction. What makes it light? No wind can blow it out. Retail 12c. Sample and sales plan 25c. New Method Manufacturing Co., Box PM-12, Bradford, Pa.

**AGENTS** Make up to \$15 daily selling Van's Rheumatic free rheumatism. \$3. Samples \$1. Van's Company, Cincinnati, O.

**AGENTS** For handkerchief; original powdered hand soap. Approved Good-Housekeeping. Everybody customer. Fine opportunity for hustler. Sample free. Solar Products, 2-2144 So. Troy, Chicago.

**\$50-500 A WEEK.** Genuine gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-E North Clark, Chicago.

**AGENTS:** Make up to \$20 a day selling \$5 value Christmas card deal for \$1.25. Wholesale sample 55c each. Sportam Co., Le Center, Minn.

**BEAUTIFUL** Christmas cards. Free gift clinches sale. \$1.00 box costs 50c. Marshall-A Publishers, 925 Broadway, New York.

**200 TO 500% Profit** making and selling your own products. We supply formulas, concentrated, free labels. Whirlwind sellers. Repeaters. Scheidt, Chemist, 535 Duane St., New Haven, Conn.

**BIG** Money selling greatest poultry egg tonic known, great repeater. Doubles egg yield. Worthington's Specialties, Box 11, 2281 Young St., Toronto 12.

**AGENTS** Selling money, showing brand new patented Dryer raincoat. Samples free. General Rainproof Co., Parkersburg, West Virginia.

**"HOW To Secure Agents,"** a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! M. L. Hand, Mgr., Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

**NECKTIES, 1931** Quality and price. Sure bargain. \$2.00 and \$4.50 dozen. One dozen sample 15 cents more for stamps. Leinhardt 1140 Hwy, New York.

**BIG** Profit putting our gold sign letters on store windows, without experience. Samples. Consolidated. 68-T West VanBuren, Chicago.

**NO-TANGLE** Ironing cord. Never kinks. Prevents scorching. Saves electricity. For telephones also. Great seller. Good profit. Free offer. Restever Co., 4315-P Irving Park, Chicago.

**FREE "Booklet** describes money making opportunities," new ideas, original plans, money making secrets and other valuable information. None require peddling or outfits. Ellis Co., 81 Ellizabeth St., New York.

**AMAZING** New novelty—"Television photos." Samples, 10c. American Specialty Company, Swampscott, Mass.

**ANYONE** Can make signs with the easiest sign letters on the market. Real paint. No brush necessary. Free sample. "Adoro," 1045 Washington, Boston, Mass.

**AGENTS** Make big money. Get our free bargain sheet. Stachler Products, 173 E. 90th St., N. Y.

**AMAZING** New metal shackle sign. Shakes striking Neonlike illustrations and wording in brilliant Neon colors. Sensational seller. \$2.95 retail. You make up to \$1.30 per sign. Men now earning up to \$25.00 daily. Write Dept. PM3, Red Lion Co., 215 - 4th Ave., New York.

**SEND** Sixty cents for samples. Take orders, make five dollars daily upward. Passok Shakerless Collars, Pankik Block, Norwalk, Connecticut.

**SOMETHING New!** Latest craze—Rubber art mats in attractive patterns and colors. Practical, serviceable, economical. Soft, easy on feet. Most women buy 3. Agents cleaning up! Make up to \$50 weekly. Also 47 other fast-selling rubber specialties. Free outfit. Write quick. Kristie Mfg. Co., 1412 Bar St., Akron, Ohio.

**ONE** Hundred percent profit. Rapid selling auto necessity without competition. Every car owner buys upon demonstration. Exclusive territory. Welkha, 147 Fulton St., New York.

**AMAZING** Profits with "No-Frost." Keeps auto windshields, show-windows, etc., absolutely clear of frost, mist, steam, rain, sleet and snow. Makes wonderful demonstration. Pocket package. Tremendous seller. Big profits. Investigate sure. Albert Mills, 9292 Monmouth, Cincinnati, O.

**GIVE** Away linters' pure thread silk stockings with wonderful value \$1.00 sets of Paris toiletries. 100% profit. Paris Laboratories, 3145 Locust Blvd., St. Louis, Mo.

**FIRE** Circulars describe how you can make big money in a mail order business at home. Agath Publishers, 1217P-Avenue U, Brooklyn, N. Y.

**300% PROFIT** In new "20-in-1" kitchen necessity. Retail 25c. Costs you \$1.00 a dozen. Sample 15c to cover cost of mailing. New Method Co., Nu-Method Bldg., Desk PM-12, Bradford, Pa.

**GUARANTEED** Hustlers—Lowest mill prices. Men's latest fancy hose—doz. \$1.10-\$2.00. Ladies' fashioned hose—doz. \$1.25-\$3.50. Catalogue free. Superior Knitting Company, Dept. 34, New Haven, Conn.

**ATTENTION** Agents! Powdered silk hand cleanser removes grease, ground-in dirt like magic. Everybody a customer. Big profits. Sample free. Adams Mfg. Co., Desk. A, Brown, Iowa.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**JUST Invented—New** washing machine. No motors or moving parts. Automatically cleans entire washing. Fully guaranteed. Retail price \$9.50. Your profit 100%. Protected territory. Preston Manufacturing Company, Dept. W-23, St. Louis, Mo.

**STOP!** 3000 Fast selling specialties from many parts of the world. Write for free wholesale catalog. Spurus Co., Le Center, Minn.

**BIG** Profits selling groceries, motor oils, paints, stock materials. Sample case free. Laverin & Browne, 1802-Y 8th, State, Chicago.

**ELECTRIC** Water heater—New. Heats water instantly. Pocket size—retails \$3.75. Two minute demonstration makes you \$1.05 profit. Lux-Viel, Dept. 127, Elkhart, Ind.

**"ANTI-STEAM"** Keeps windshield clear of steam, frost, rain, snow. Remarkable seller. Unprecedented opportunity. Free sample proves this. Walter S. Doe & Co., Kent, Ohio.

**300% PROFIT** Selling Mystery Gas Lighter. Retail 25c. Costs you \$1.00 doz. Sample free. Square Deal Mfg., Desk PM-28, Bradford, Pa.

**SAMPLE** \$2.50 Gem on approval to prove our marvelous Mexican Blu-Flash Gem positive matches finest blue-white diamond style-by-style. Guaranteed 20 years. Sells on sight; enormous profits. Write quick. Mexican Gem Co., Suite PM2, Minneapolis, Minn.

**ADDING** Profit. Adds mechanically. New inventions selling like wildfire. Agents wanted. Get sample immediately. Add-O-Graph Co., Dept. 27, Salina, Minn.

**THOMAS** Waiting to buy the Presto Electric Motor Heater—Automobiles start instantly on cold days. Big profits. Easy seller. Write for free sample offer. Metal Specialties Mfg. Co., 3200 Carroll Ave., Chicago, Ill.

**MAKE** Old clocks electric. Big profits. Restever Co., 4315-P Irving Park, Chicago.

**MILLIONS** Of dollars will be saved by the American public with our new product. Cash in \$12.50 daily on \$12.50 investment. Nreco Products, 145 W. 21 St., N. Y.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**A BUSINESS** Of your own—Making sparkling glass mugs and number plates, checkboard signs. Big book and sample free. E. Palmer, 512, Wooster, Ohio.

**AGENTS—Clear** Intention! Inkopus makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marvel Company, Tribune Bldg., New York, N. Y.

**AGENTS** Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filter Co., 353 Broadway, New York.

**MAKE** Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

**FREE "Booklet** of money making opportunities," new ideas, original plans, money making secrets and other valuable information. None require peddling or outfits. Ellis Co., 81 Ellizabeth St., New York.

**NEW, Profitable—Sell** auto men made. Quality rubber with owner's name molded white. Details free. Elbonite Products, Dept. Z-10, 893 Main, Akron, Ohio.

**CASH** In your pocket every day. Every man needs pants, breeches, overalls, shop-coats. Longwear's work clothes sell on sight. Sell free with every order for 3. No investment. Complete sales outfit free. Write today. Dept. PM2, Longwear, 439 Browne St., New York.

**DON'T** Choke me! Hot Shot new electric starts cars without choke; saves gas oil. Delivers 1,400 cfm. \$1.50 seller. Pays for self immediately. Hustlers add mine. Beardon Mfg., Dept. 13-PM, Peoria, Ill.

**STRANGE** Ironing cord. Prevents scorching. Saves electricity. Avoids kinks, marks. Approved by Good Housekeeping. For telephones also 300% profit. Samples furnished. Neworknet, Dept. 12-A, 4501 Kensington, Chicago.

**AGENTS-DISTRIBUTORS.** Big profits. Your own business. Sell dealers and consumers new, marvelous hand and household cleanser. Buddy Manufacturing Co., End, Minn.

**300% PROFIT** Selling new 20-in-1 kitchen utensil. Retail 25c. Costs you \$1.00 doz. Sample 15c. Square Deal Mfg. Co., Desk PM-3, Bradford, Pa.



**MARVELOUS** Chemical cloth cleans, polishes all metals instantly without liquid, paste, powder; record-breaking seller to housewives, stores, offices; 300% profit. Sample free. Shelf D. Mfg. Co., Waukegan, N. J.

**BIG** Money maker, simply showing new Pelly Wrench, 10 wrenches in one. Guaranteed fast seller. Sample furnished. Gold-Man Manufacturing Co., Dept. PM-12, Rock Island, Ill.

**EVERY** Auto owner a prospect. Saves gas, more pep, prevents plugs from fouling. Get yours free—two for the price of one. Enclose \$1.50 with your order, sell one and get your money back. Our agents average \$2 per day. Spark-Rite Company, 1816 N. Crawford Ave., Chicago, Illinois.

**RAZOR** Blades, double edge, improved-blend ground, ten cent packages, carded, easy selling. Sold everywhere. Standard Safety Razors, Pittsburgh, Penna.

**FORTUNE** Mothers looking for. Sleep-warm blanket holder. 25c brings \$1.00 sample. Balzak, 4018 Division St., Chicago.

**NEW** Big-profit proposition. Cheraria, Shelton St. Bldg., Buffalo, N. Y.

**AGENTS**—100% Profit selling "Quick-Striker" long wear non-skid shoe soles. Sample pair 15c cents. Specialty Supply, Box 618-G, Chicago.

**SELL** Call dehorning pencils to farmers. 1109 Grinnell, Peoria, Illinois.

**GENUINE** Gold Leaf Letters anyone can put on store windows. Guaranteed to never tarnish. Large profits. Enormous demand. Free samples. Write today. Metallic Letter Co., 438-D North Clark, Chicago.

**NEW** Changeable sign sells to stores for \$1.50, agents profit 400%. Particulars free. National Sign System, St. Louis, Mo.

**AUTO** Mitten dusters. Season's biggest selling hit. Over 200% profit. Free sample offer. National Fibre Droom Co., St. Louis, Mo.

**MILIONS** Washboard at home. Costs near 5 cents per square foot. You charge 75 cents. Profitable business. Plating auto-parts, reflectors, tableware, stores, refinishing metalware, etc. Outfits furnished; details free. Write Speinkle, Plater, 123, Marion, Ind.

**MEN** And women, earn five to ten dollars daily. Full or part time. Lowest prices for guaranteed hosiery, hosiery, underwear. Send for catalogue and full information. Monarch Hosiery Co., 424 Market Street, Philadelphia, Pa.

**POLMET** Polishing Cloth removes tarnish from all metals without the use of liquid, paste or powder. Our agents say it sells like "hot cakes." Retail \$2; sample free. Galt & Co., Inc., 15 Edinboro St., Boston, Mass.

**PHOTO** Medallion men and women, the largest line of photo novelties in the world. Lowest prices, quickest service. Send for catalog showing over 200 money makers. Gibson Photo Jewelry Co., Inc., 823-827 Grand Ave., Brooklyn, N. Y.

**DAILY** Necessity in homes, factories, garages. Quick seller. Fine repeater. Big profits. Exclusive territory. Sample free. Lawndale Products Co., 3208 W. 22nd St., Chicago.

**PROFITABLE** Home business. Legitimate. No canvassing. Maywood Publishers. P-223 Broadway, New York.

**NO** Dull times selling food! People must eat. Federal distributors make big money; up to \$3,000 yearly or more. No capital or experience needed; unsold goods may be returned. We furnish free sample case, license and free samples for customers—sure repeat orders. Exclusive territory. Ask now. Federal Pure Food Co., A2307 Archer, Chicago.

**400% PROFIT** Selling slams used everywhere. Largest selection, wonderful repeat business; \$1.00 worth samples, 25c; 30 slams, \$3.00, 100 slams, \$5.00. P. Franklin Co., 3512 Third Ave., N. Y.

**DOLLARS** in "Fixit" service, depression killer. Particulars, Houlgate's "Fixit" Service, 1205 N. Elmhurst, Pasadena, Calif.

**WOULD** You like to make \$10 to \$15 a day selling our line of toilet preparations? We want agents in every town; men, women, students; whole or part time. Write for free sample outfit offer. Hindo Perfume Co., 515 E. 47th St., Chicago, Ill.

**A BILLION** Ideas. This is the title of our remarkable catalog of books along practical lines. Arranged alphabetically by subjects for easy reference. If you have not received it, send for a copy. You will find hundreds of subjects you cannot usually locate in book stores or public libraries. Sent free upon request. Popular Mechanics Press, Room 302, 240 E. Ontario St., Chicago.

**MAN** In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; for new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

**MAKE** Sell your own products. Formula catalog free. Closer Laboratories, (F36) Park Ridge, Ill.

**BIG** Proposition; no canvassing. Asco, Box 1081, Washington, D. C.

**BIG** Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

**AGENTS** Stamping names on pocket-key protectors. Sample check with your name and address, 25c. Stamping outfit, Emblem checks, check-books, name plates. Hart Mfg. Co., Desk 2, 300 Degraw St., Brooklyn, N. Y.

**REPLATE** Brass worn-off automobile parts, reflectors, bath room fixtures, worn seasons, forks, etc. with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no injury; \$1.00 half pint. Postpaid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

**BIG** Money selling shirts, ties, underwear, socks, raincoats, lumberjacks, sweaters, leathersuits, overalls, pants, pyjamas. Outfit free. Kinzel Co., Dept. 8, 4922-23 Lincoln Ave., Chicago.

**SELL** Goodyear raincoats, \$2.95 up. Goodyear Rainwear, 18 West 22nd, New York.

**SOMETHING** The housewife wants. A signed guarantee to save money and time in cooking. No competition. 400% profit. No license required. Station C, Box 25E, San Diego, Calif.

**TIKALY** Formulas produce perfect products. All lines. Catalog free. B. Thaxly Co., Washington, D. C.

**AGENTS**—Engraved name plates, signs, number plates etc., easily sold with large profits. Brett Bros., Wrentham, Mass.

**NEW** Line Counter Displays, Aspirin, Flints, Chewing Laxative, Breath Gum, Nostril, Silks, etc. Ready Repeat. Over 100% Profit. Superba Co., W3, Baltimore, Md.

**THIS** Advertisement may make you thousands of dollars, if you write immediately for my "Eye-Opening" literature describing guaranteed formulas; valuable trade processes, money-making information how to easily make the world's best-selling specialties. All lines. Investment small. Profits immense! Start in your home, room or office. Make the good money you're entitled to. Dr. Liberman Miller, Chemist, Tampa, Fla.

**CHICAGO** Export valued \$3 since 1890. The diamond's only guaranteed rival. Greatest spare time, side-line article ever known! Amazing profits. \$5 pocket sample case free. Write quick. Mexican Gem Company, Dept. PM, Monterey, Calif.

**WE** Start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 441, St. Louis, Mo.

**FLAVORING** Extracts—Bottle yourself! Labels furnished. 500% profits! Whirlwind money-makers! Repeaters! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

**CALIFORNIA** Perfumed beads, selling like hot cakes. Agents making money. Catalog free. Mission Factory, P. 2024W, Pico Los Angeles, Calif.

**SELL** Stores for carded breathers, etc. Loran Products, Albany, N. Y.

**SELL** Men's neckwear—wonderful proposition. Astor-M, 39 East 25th, N. Y.

**BEST** Books for \$1. All formerly sold for \$2.50 to \$3 each. Select from the following list of guaranteed bargains. All brand new books: Woodcraft by Seton, Book of Letter Writing by Crowther, Elliquette by Eichler, Creative Chemistry by Shanon, Revolt in the Desert by Lawrence, Trader Horn, White Shadows in South Seas by O'Brien, Count Luckner (The Sea Devil) and Outline of History by Wells. Delivered at your door C. O. D. Simply pay postman \$1 each and postage. Popular Mechanics Press, Room 302, 240 E. Ontario St., Chicago.

**MANUFACTURE** Chipped glass house numbers. Beveridge, 140-22 Locust, Jamaica, N. Y.

**SUCCESS** With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Expert analytical service. Catalog free. B. Thaxly Co., Washington, D. C.

## HIGH-GRADE SALESMEN WANTED

**MAKE** Big money now—selling, demonstrating, new Stewart-Warner Changeable Write-It-Yourself Electric Sign, the fastest selling, biggest-valued, most unique electric sign on the market. Print, write, draw anything on it, any color, as you do on a plate. Fairly blazes forth; with mean effect! Every locality packed with prospects. Full line. Prices reasonable. Big discounts. For producers, a chance for immediate advancement on a product built by Stewart-Warner, famous for quality the world over. An unbeatable opportunity for distributors, even managers, specialty salesmen. Write to Stewart-Warner Corp., Dept. C, 1825 Diversey Parkway, Chicago.

**DON'T** Be a job hunter—Start your own city business on our capital; no hard times, no lay-offs, always your own boss; handsome average \$5,000 annual sales year after year; we supply stocks, equipment on credit; send 223 home necessities, selling experience unnecessary; wonderful opportunity to own pleasant, dignified, profitable business backed by \$17,000,000 world-wide industry; for complete information write Kameleh Co., Dept. L-U-PPM, Freeport, Ill.

**MEN** To cover small town and rural districts with nationally known line of motor oils, paints and rusting, sold on easy credit terms to farmers, property and auto owners, mechanics, factories, etc. You carry no stock. We ship from nearby warehouse and collect. Commissions paid weekly. Bonuses monthly. State territory wanted. Write Central Petroleum Co., 703 Century Bldg., Cleveland, Ohio.

**SALESMEN**—Four \$15.00 sales to stores net you \$43.00 daily. Payora Systems, Est. 1895, 2801-123 Sheffield Avenue, Chicago, Illinois.

**SALESMEN-DISTRIBUTORS**. New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100%. Up to 300% to dealers. Easy sell-off. Exclusive territory. Economy Rubber, 608 Burkhardt, Dayton, Ohio.

**NEW** Cigarette roller. Real proposition to hustlers. E-W Specialty Co., Postoria, Ohio.

**DISTRIBUTORS**, Salesmen—Newly patented automobile accessory, burglar proof. Fast seller. Inexpensive, highly profitable. Automatic Gas-Lok, 21 E. Vanuren, Chicago.

**BRAND** New—Sure fire trade-stimulator. Every retailer buys. \$50-\$200 weekly in advance. Well rated company. Free pocket outfit. Salesmanager, 4th floor, 308-N Michigan, Chicago.

**BIG** Profit putting our gold star letters on store windows, without experience. Samples. Consolidated, 69-V West Vanuren, Chicago.

**FREE** Booklet describes 67 plans for making \$20-\$100 weekly in home or office business of your own. Silco Co., 81 Elizabeth St., New York.

**FASTEST** Selling automatic free wheeling—lowest price, most profit, quickly installed, any automobile distributor. Wanted quick action. Secure territory. Automobile, 216 North Erway, Dallas, Texas.

**SALESMEN** Wanted to call on fish dealers. Snow & Parker, Inc., 41 Fish Pier, Boston, Mass.

**TAKING** Orders for shoes, direct from factory to wearer pays big money. Free outfit. Marion Shoe Mfg. Co., Dept. M-23, Chingwa Falls, Wis.

**PATENTED** Envelope sealer. Sells 3,000 hourly! Retail \$1.50 each. Offers buy at sight! Tremendous demand. Free trial. Sender, 3031 Spring Lane, Boston.

**SCREW-HOLDING** Screw drivers! Not magnetic. Remove, hold, insert screws in accessible places! Factories, garages, electricians, carpenters, mechanics, radio owners, buy on sight! Free trial! Miller, 5013 Winthrop Bldg., Boston.

**SALESMEN**—To sell well known desk stapling machine for an old established firm; indispensable to large and small businesses; age and previous experience unimportant. The man who will work hard and follow instructions will make plenty of money; strictly commission; no drawing account. Hugo Mfg. Co., 21 East 21st St., New York.

**EVERY** User of the mails needs an envelope sealer. The Kendall seals after a minute. Retail \$2.50. Big profit. Good territories. Kendall, Dept. T, East Jaffrey, N. H.

**DISTRIBUTORS**, Organizers and agents exclusive territory for Soderite the new fluid solder that needs neither heat nor acid. See November Popular Mechanics, page 143. Write Fluid Solder Products Company, 1440 S. Wabash, Chicago.



**GRAPE Belies.** Grape concentrates—Port, sherry, champagne, claret, etc., in solid brick form. One brick makes one gallon juice; legally established twice in Federal courts. Government financing industry. Every home, drug and grocery store, church, hospital, a prospect. State and county rights available. Apply V. S. Co., Dept. B-219, 325 - 34th St., San Francisco, Calif.

**325 DAILY** Possible selling merchants printing, novelties, souvenir items at half price. Quick delivery. Union label. 40% commissions advanced. Experience unnecessary. Elaborate outfit free. Northwestern, 425-51, Jackson, Chicago.

**NEW, Different, improved, business stationers line.** Biggest commissions—bonuses. Quickest delivery. Free copyrighted cuts. Experience unnecessary. Attractive outfit free. David Lionel Press, 512 So. Hamilton, Dept. 528, Chicago.

**PENICBOARD Salesmen**—Most gigantic line ever featured. Vending machines—all kinds. Make as high as \$28.00 on single order. Repeat commissions. Beautiful colored catalog free. Lion Mfg., Dept. 16, 305 W. Erie, Chicago.

**WANTED**—County salesman with car. to demonstrate for large Ohio manufacturer. First class job. Fry-Peter Co., 2210 Fry-Peter Building, Dayton, Ohio.

**\$18 TO \$25 Daily** biggest selling line of men's suits. Meets present day conditions. Amazing values at \$11.95, \$14.50, \$16.95, \$18.95. Also raincoats, slickers, topcoats and boys' suits. Biggest commission paid in advance. Liberal bonus. Free outfit. State age and selling experience. "Tim" Foster, Inc., Dept. 215, 2250 South Scoville Ave., Chicago.

**\$136.00 COMMISSION** From \$4.95 sale! You can make 3 sales daily. Our salesman do it. Free kit. Sales Stimulators, Dept. 99, 4211 Ravenswood, Chicago.

**SALESMEN**—At last! New feature sells punchboards everywhere. Dealers sold with for—property back again. Profits enormous. Samples free. Puritan Co., 1403 Jackson Blvd., Chicago.

**NEW Legal** punchboard plan! We furnish everything! No investment for you or your customer! Nothing to sell or carry! 50% profit! Unsatisfactory merchandise returnable! Full repeat commissions. All novelty company, 161 Washington, Chicago.

**Pull Big Income**, sell garages, gas stations, machinery, etc. men, amazing safety non-slip shoes. Exp. unnecessary. Sample free. Atlas Shoes, 78 Waltham, Mass.

**Men To sell batteries** with complete line of supplies to garages. Lowest prices. Mikkman Battery Co., St. Paul, Minn.

**\$15.00 DAILY** Selling Union Label business and better made. 1000 for \$1.50 including card case. Free out service. 33% commission advanced. Outfit free. National, 108-28 No. Jefferson, Chicago.

**SKILL Nothing**—\$170 weekly. \$300,000 punchboard firm announces new No investment plan. Season starting. K&S, 4326 Ravenswood, Chicago.

**APLENTY New**—Different—Fast selling 50—100 merchandise at attractive counter cards. 100% comm. for you and dealers. Advertised once WLV 3 nights weekly. No investment. Catalog free. (Estab. 1921.) World's Products, 173 Central, Spencer, Ind.

**BURGLAR** Proof window lock permits ventilation with safety. Salesmen and distributors write. Samples 25c. Sarchet Bombs Co., Charles Bldg., Denver, Colo.

**COLOR** Lighted Christmas novelties are best sellers. Write Under, 5719 Harrison, Chicago.

**MAKE** Up to \$18 daily introducing men's, women's, children's dress history. Guaranteed 6 months or replaced. Amazingly low prices. 126 styles, colors. Auto and history given producers. Write quick! Wilburt History Co., C512 Midway, Greenfield, Ohio.

**BIG Money** steady. High grade corsets, shopcoats, pants, shirts. Advertising on back. Fast sellers. Great demand. Prospects everywhere. Free outfit. Strong Mfg. Company, 911 West Jackson, Chicago.

**BIG Money** selling shirts, ties, underwear, Sox, raincoats, lumberjacks, sweaters, leathercoats, corsets, pants, play suits. Outfit free. Nited Co., Dept. 65, 4322-23 Lincoln Ave., Chicago.

**NEW Polish** for silver, pewter, brass, etc. Big profit, easy sales. Modern Polish Co., Trenton, N. J.

**SALESMEN**—Become independent. Own your business; experience unnecessary. Selling our \$10,000 accidental death; \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady income from terminals, \$200.00 deposited insurance department. Universal Policy, Dept. A, 710 Lafayette Bldg., Newark, N. J.

**WONDERFUL Opportunity.** Twenty dollars per day can be earned. Experience unnecessary. House protection at cost. Ages one to eighty. \$250 to \$1000 at death. No insurance. You make \$5 for each member secured. Childless of Virginia, sent in 54 one day. National Aid Society, Myers Building, Springfield, Illinois.

**PENNY Coffer**, new fascinating coin-controlled game. Legal. Exciting. Merchants everywhere buy. Splendid commission. Specialty Mfg., 617 Division, Chicago.

**SELL Egg Cartons!** Dandy repeat side line. Everyone who sells eggs needs cartons—grocers, poultry farms, dairies. Send for information and samples. Pick up these extra commissions. Self-locking Carton Company, 575 E. Illinois Street, Chicago, Ill.

**GREAT Side-line** for any salesman! Pocket outfit free. New cash customer Building Campaign for merchants. D&H Premium Co., Dept. 528, 116 So. Wells, Chicago.

**NEW Specialty**—Sells every business and professional man. For \$15 sales daily for \$280 weekly. Power cleared \$4920 in three months. Write, P. E. Armstrong, President, Dept. PM, Mobile, Ala.

**NEW, Largest** order catalogues, punchboards, vending machines, produce quicker orders, big commissions. Free outfit. Lincoln Sales, 116 So. Wells, Chicago. Dept. D. Established 20 years.

### HELP WANTED

**A RICH Opportunity**—men-women! The offer of a lifetime! We put you in a business of your own which once started, becomes self-sustaining, requiring an investment of less than two dollars. Our plan pays you up to \$25.00 and more each profit everyday with no selling. Grab this bonafide opportunity to enjoy complete financial independence, be your own boss. Quick action necessary. Wire or write at once. The Plaque Studios, Inc., 58 E. Randolph, Dept. 25, Chicago, Ill.

**\$10 TO \$35 Weekly** mailing circulars, no canvassing. Samples, instructions. 25c. Pamphlets, 2305 Gratz, Philadelphia.

**IF You want** to get your groceries and household supplies at wholesale, and a wonderful chance to make \$15 cash profit a day besides, send me your name immediately. No experience necessary. Albert Mills, 5203 Monmouth, Cleveland, O.

**WORLD'S First** one handed ear heater. Gold-coin for agents. No high pressure selling. Spectacular demonstration gets orders like magic. Every woman wants one. Low price. Big profits. Write quick for territory, and free offer of sample. Quik-Whip Co., 500 N. Dearborn, Dept. WC-512, Chicago.

**EARN** Up to \$25 weekly or more growing mushrooms in your cellar or shed. Illustrated booklet free. American Mushroom Industries, Dept. 597, Toronto, Ont.

**MAIL Order house** wants ambitious young men each county to mail circulars, appoint agents, fill orders. Experience unnecessary. Part or full time. Good pay. International Laboratories, 192 N. State, Chicago.

**GO Into business**—Make big money. We start you furnishing everything. Experience unnecessary. Federal Pure Food Co., 23207 Archer, Chicago.

### EDUCATIONAL AND INSTRUCTION

**SOUND** Motion picture operators wanted. Learn to operate. Free practical training when course is completed. Easy terms. 30% of tuition payable when employed. 103 North Rowan Ave., Dept. A, Los Angeles, California.

**BECOME** A landscape architect. Unexcelled professional; wonderful opportunity for money-making. Easily mastered by mail. Earn while you learn. Est. 1916. Write for details. American Landscape School, 7 Plymouth Bldg., Des Moines, Ia.

**LEARN** Automobiles, electricity, fenders, bodies, welding. Starlin's, 2008A Main, Kansas City, Mo.

**LEARN** Rapid figuring from "Higher Arithmetic." Write for information. Fredrick A. Smith, 4745 Virginia Ave., Chicago.

**IMPROVE** Your handwriting. Gaskell's penmanship course gives 20 separate lessons and complete book of instructions. Only \$1.00. Gellive Publishing Co., Dept. 29, 57 Ross St., New York.

**WANT** A Government job? Steady. \$105-\$250 month. Men-women, 18-54. Paid vacation. Short hours. Common education usually sufficient. Experience usually unnecessary. 25 coached free. Full particulars and list positions free. Write today sure. Franklin Institute, Dept. K2, Rochester, N. Y.

**FINGER Print** and secret service particulars free. Write, American Institute, 2190 Broadway, N. Y.

**LEARN** Photo-engraving at home by experience. Equipment furnished. Earn while learning. Address Photo-Engraving School, Aurora, Mo.

**DOUBLE** Entry bookkeeping 60 hours with 8 keys guaranteed. (Diplomas.) International Bookkeeping Inst., 3 Springfield, Mo.

**BECOME** A foreman. Increase your wages. Send 5c stamp to H. J. Montgomery, outstanding authority on foremanship training, for valuable booklet, 40 North Wells St., Chicago, Ill.

**LEARN** To repair and rewind electric motors. Send for free information. Randle Bros. Armature Shop, 520 4th St., Waukegan, Ill.

**PHOTOPLAY** Talking picture and magazine stories wanted for revision, development and copyright. Sell on commission. Established 1917. Booklet free. Universal Scenario Company, 406 Meyer Bldg., Western and Sierra Vista, Hollywood, Calif.

**WANTED, Men-Women, 18-50**, qualify for steady Government jobs. Salary range, \$105-\$250 month. No Government experience required. Paid vacations. Common education. Thousands appointed yearly. Write General Institute, 101, St. Louis, Mo., immediately.

**U. S. GOVERNMENT** Wants men, \$1,700-\$1,900 and up at start. Railway mail clerk examination coming. Let our expert (former government examiner) prepare you for this and also rural carrier, post office, customs, internal revenue, and other branches. Write today for free booklet. Dept. 3, Pasternon School, Rochester, N. Y.

**DON'T** Prepare for any civil service examination without seeing our catalog. Free. Columbia Correspondence College, Washington, D. C.

### SHORT STORIES

**LEARN** To write news. Expert newspaper men will give you complete course of training by mail. Send for free writing test. Newswriter Associates, 7407A 8, Harvard Blvd., Los Angeles, Calif.

**SHORT** Stories revised, typewritten and marketed. Details free. Hursh Service, Box P-1813, Harrisburg, Penna.

### TYPEWRITERS AND SUPPLIES

**TYPEWRITERS**—All makes, \$4 to \$32. Guaranteed. Catalog free. Typewriter Works, Ada, Okla.

### ADDING MACHINES

**NEW \$4.55** Automatic Adding Machine. Fully guaranteed. Bassett, 1438-C, Hollywood Avenue, Chicago.

### PRINTING, MULTIGRAPHING AND MIMEOGRAPHING

**200 BOND** Letterheads 20-lb. (8 1/2 x 11), envelopes, cards, statements, \$1.00 each, postpaid. Samples. Roland Comagay, Warrham, Massachusetts.

**PERSONAL Stationery**—100 sheets, 50 envelopes with name and address \$1.00. Foreign postage extra. Sidney Studio, Kidner, Ohio.

**500 TWO-COLOR** Letterheads \$2.50. Classy printing, prompt service. Mailpress, Cincinnati.

**15 PERSONAL** Christmas cards \$1.00. Applebaum-P, 1258 Brook, New York.

**COMMERCIAL** Printing, Hammermill bond, 1000, \$2.75. Bell Press, Winton, Penna.

**TWO-COLOR** Envelope printing at one-color prices. Samples. Rapid Service, Edwardsville, Ill.

**COMMERCIAL** Printing, Barstow, Quality, 5105 E. 18th, Kansas City, Missouri.

**200 BOND** Letterheads, 100 envelopes \$1.00, also mimeographing. Blueprint Company, 1037 East 146 St., Cleveland, Ohio.

**5,000 ATTRACTIVE** Folders, 1,000 words, \$11.50; 600 circulars, \$7.50. \$1.00 each, balance c.o.d. Samples. Goodprint, Harrisburg, Pa.

**QUALITY** Printing for less—500 letterheads—envelopes \$3.75, thousand circulars \$2.00 prepaid. New-depression price list. Pound samples, dime. Big plant. Webb-Print-Press, Gettysburg, Penna.

**1000 BUSINESS** Cards \$1.75; letterheads, envelopes, statements \$2.25, postpaid. Samples. Dept. P32, 3311 Lidstone, Houston, Texas.



**AGENTS.** Three-color business cards, \$2.95 thousand. Crescent, 1715 1/2 Wood, Dallas, Texas.

**1000 BUSINESS CARDS.** card case, \$1.50. Miller, Printer, North, Pa.

**200 LETTERHEADS** And 100 envelopes, \$1.40; 200 letterheads, \$1.11, 150 envelopes, \$2.00; 250 cards, \$1.00. Hoosier Print Shop, Portland, Ind.

**500 LETTERHEADS, 500 Envelopes** \$2.95. Ware, Box 357, Ft. Madison, Ia.

**WE** Print stationery, booklets, catalogs, circulars. Samples. Commercial Press, Bayville, Ohio.

**LETTERHEADS.** Envelopes, 500, \$1.10; 1,000, \$2.00; \$5,000, \$8.00, plus postage. Samples. Corle & Kimball, Newport, N. Y.

**250 BOND LETTERHEADS,** envelopes, billheads, cards, \$1.35 each. Brownell Press, Leonia, N. J.

#### PRINTING OUTFITS AND SUPPLIES

**PRINT** Your own circulars, envelopes, with home made press costing less than \$1.00. Illustrated instructions 10c. Carl Edquist, Odessa, Minn.

**BUILD** An 8x10 printing press for \$1.00. Complete instruction only 50 cents. K. Wise, 100 E. Broadway, Red Lion, Pa.

**COMPLETE** Printing outfits, presses, type, ink, paper, supplies. Write for free catalog. Kelsor Co., B-11, Meriden, Conn.

**PRINTING OUTFITS**—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

**PREPRESSED** Printing presses and supplies. Lists 2c stamp. Popular Bargains, Richmond, Pa.

#### GUMMED LABELS

**COLOR** Stickers past. Economical, too. Samples. Harvey Wolf, 6618 F Quincy, Cleveland, Ohio.

**1,000 PRINTED:** Name, business, address 50c. JBS Company, Box 93, Holyoke, Mass.

#### DUPLICATORS AND DEVICES

**"EXCELLOGRAPH"** Rotary stencil duplicator \$39.00. "Two-Faced" film duplicator \$4.00. Booklet free. Pittsburgh Typewriter Supply, Dept. 601, Pittsburgh, Pa.

#### RUBBER STAMPS

**NAME, Address, 2 lines 25c; 3 lines 35c.** Stamp Works, Auburn, Me.

#### FOR SMOKERS

**CUT** Your cigarette cost—Send for factory fresh Green Rivers at \$1.25 per carton, 240 cigarettes, postpaid. Smoke 5 packs. If you don't enjoy milder more tasty natural flavored smoke—return 3 packs and get \$1.25 back. Green River Tobacco Co., Box 920, Greensboro, Kentucky.

**HOME** Cigarette machine! Illustrated circular, \$3.75 postpaid. Automatic Cigarette Machine Wks., 1655 Sheridan, Chicago.

#### RAZORS AND BLADES

**YOUR** Gillette. Probak blades resharpened. 1c each. Petter Waterquist, Rockford, Ill.

**TWENTY** New "Gillette-style" guaranteed blades, \$1.00. Sell Tucker, Shavokhi, Pa.

**ELECTRIC** Safety razors \$5.00. Simplex typewriters \$2.50, printing presses \$10.00, catalog 5c. Cash paid cold, jewelry, names artificial eye users. Denver, 114 Ford St., Providence, R. I.

**SPECIAL.** Any small razor blade honed keen 1c each. Satisfaction guaranteed. Perla, 4870 North Ashland, Chicago.

#### FOR THE HOME

**BURGLAR** Alarm—dool proof. Electric alarm goes off, even if the wires are cut! Always on the job! Easy to install. Send 50c for drawing, etc. Wm. Osterle, Jr., Milway, New Jersey.

**KEEP** Your walls clean. Beautiful radiator shields, perfect to sell. Write for folder. Leader Metal Prod. Co., D-4, St. Louis, Mo.

#### FIELD GLASSES

**\$12.50** GOVERNMENT Binoculars, 8x2 power with leather case, worth \$25.00. Wonderful for hunting. Big selection guns, rifles, musical instruments, field glasses, telescopes. Buy, sell and exchange. Send now free list. We'll Curiosity Shop, 26 South Second Street, Philadelphia, Pa.

#### PRECIOUS STONES

**(DIAMONDS Real)** genuine Zircon, deep blue, pale blue, golden brown, and blue white. Sample blue white \$3. Goetz Gem Co., Gallon, Ohio.

#### ANTIQUES, WAR RELICS AND INDIAN GOODS

**ANTIQUES, Firearms, medals, swords, daggers, relics.** Catalogue free. Nagy, 89 South 18th, Philadelphia.

**INDIAN** Mail bracelets post paid \$1.00 with pamphlet explaining symbols, made of 999 fine silver hand work. The Wigwag, Colo Springs, Colo.

**INDIAN** Relics, coins, curios. Beadwork. Catalog free. Vernon Lemley, Northbranch, Kan.

**SEND** 5c For free new list Indian relics, antique firearms. F. E. Ellis, Webster Groves, Missouri.

#### MUSIC AND MUSICAL INSTRUMENTS

**FORTUNES** Being made from songs through talking pictures, radio, photograph, music publishers. "Hit" writers, critics, arrange, compose music to your lyrics. We submit to studios and other markets. Free reading. Send for booklet. Universal Song Service, 625 Meyer Bldg., Hollywood, Calif.

**SONGWRITERS**—Read "song requirements of talking pictures, radio and records" an explanatory instructive book sent free to aspiring writers of words for songs. We compose, arrange music and secure copyrights. Write today. P. C. Newcomer, Associates, 1674 Broadway, New York.

**WRITING** A song 25c. Connor, 24 East, Chicago Falls, Mass.

**Duo-Flex** reeds for clarinets and saxophones eliminate your reed troubles. Write for circular, Duo-Flex Reeds, 1204 1st Ave., Knoxville, Ind.

**COMPOSERS**—Verse or music. Brilliant opportunities. Write VanKuren, 2550 McClellan Bldg., Chicago.

**SONGWRITERS**—"Real" proposition. Mueller, Ill. 2184 Keystone, Chicago.

**SONGWRITERS.** Professional plan. Edward Madden, 112 Michigan, Syracuse, N. Y.

**SONGWRITERS**—Free booklet "How To Turn Your Songs Into Gold." Stan Tucker, 310 Wadsworth Ave., New York.

**SYSTEM** Complete \$1.00. Address "Music Boothland," Plomo Beach, California.

**SONG** Posts, write Sequia Songwriters Service, Sherman Branch, Los Angeles, Calif.

**POEMS** Wanted. Work guaranteed. We publish. Great Eastern Song Bureau, Dept. 27, Thomaston, Me.

**SONG** Writers. Send for our "Publishing Agreement." McKinley Music Printers, 1201 E. 55th St., Chicago.

**WRITE** Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Moore Ave., Chicago.

**"MUSIC** Composed" to words. Bauer Bros. (formerly of Sousa's Band), Oshkosh, Wis.

**SEND** Song poems, 50-50 plan. Indiana Song Bureau. (Brookside), Salem, Ind.

#### PATENT ATTORNEYS

**PATENTS.** Reasonable rates. Write. The Ramsey Company, World Patent Attorneys, 270 Bank St., Ottawa, Canada.

**WRITE** For free papers, or send sketch or model and description of your invention, and I will send you information showing how to proceed to obtain a patent. No charge for this advice. M. H. Ford, registered patent attorney, 225 Broadway, New York.

**WHAT** To Invent—Names of manufacturers and wanted inventions sent free on request. Write W. T. Greene, 945 Barrister Building, Washington, D. C.

**SELL** Before patenting. Save time, expense. Safe, efficient plan (copyrighted). Booklet free. Chartered Institute American Inventors, 1136 Barrister Building, Washington, D. C.

**PATENT** Your invention: Send for free book, "How to Obtain a Patent," and "Record of Invention" blank. Consult us about how to protect your ideas. Victor J. Evans & Co., 4011 Victor Bldg., Washington, D. C.

**PATENTS** Several. Promptness and skill assured. Examination and advice free. Book sent free. Randolph Company, Section-486, Washington, D. C.

**"INVENTOR'S** Guide," valuable information, free. Frank Lefermann, Registered Attorney-Engineer, 1712 Woodworth Bldg., New York.

**PATENTS** Procured, Prompt, careful, efficient service. Highest references. Moderate fees. Send sketch or model for actual search and advice. George P. Kimmel, Master of Patent Law, 34-L Westway Bldg., Washington, D. C.

**LACEY'S** Patent Sense. Valuable book free. See ad page 134.

**MANUFACTURERS** Everywhere seek new inventions to improve their product. Names of manufacturers and wanted inventions sent free on request. Write W. T. Greene, 945 Barrister Building, Washington, D. C.

**TIME** Counts in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**INVENTORS:** Send for booklet telling how to patent and sell your inventions at lowest cost. Ralph Burch, Patent Lawyer, 900 F St., Washington, D. C.

**PATENTS.** Send sketch or model for advice. Free book, "How to Obtain a Patent." Established thirty years. Highest references. Prompt service. Reasonable charges. Chandler & Chandler, 285 F Street, Washington, D. C.

**PATENTS** Procured; trade marks registered—preliminary advice furnished without charge. Booklet and form for disclosing ideas free. Irving L. McCathern, 704 International Bldg., Washington, D. C.

**PATENTS.** Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

**ESTABLISHED** 1854. John B. Stevens Company. Free booklet. Patents. Trade marks. Copyrights. Offices. Monadnock Block, Chicago; Barrister Bldg., Washington, D. C.

**LANCASTER,** Allwins & Rommel, 231 Quay Bldg., Washington, D. C. "Outlines of the Form Evidence of Conception." Before disclosing your invention to anyone send for blank form to be signed and witnessed. Form and patent information booklet free.

**PATENTS**—Write for free information, How to Obtain a Patent and Record of Invention—or send drawing or model for examination. Miller & Miller, Patent Attorneys (former Patent Office Examiners), 1605-A Woodworth Building, New York; 623 Earle Building, Washington, D. C.

#### FOR INVENTORS

**PATENT** Your invention: Send for free book, "How to Obtain a Patent," and "Record of Invention" blank. Consult us about how to protect your ideas. Victor J. Evans & Co., 4011 Victor Bldg., Washington, D. C.

**SEND.** Practical inventions, patented, unpatented, in demand. Write Chartered Institute American Inventors, 1136 Barrister Building, Washington, D. C.

**INVENTORS** Manual. Not an advertisement. Explains why inventors get defrauded. Instructs correct methods of protecting, estimating worth, and profitably selling inventions. May save you thousands of dollars. Low cost. Send \$1.00 immediately for complete manual or write DuVan International Company, Chamber of Commerce Building, Cincinnati, Ohio.

**NATION** Wide search for best inventions. American Society of Inventors, Crosby Bldg., Buffalo.

**INVENTORS!** Copyright a description or drawing of your patented article in our magazine. Thus get in touch with the right sort of promoter. Promoters, advertise your wants and get in touch with the inventor you are seeking. New Ideas Magazine, 445 Lankershim Bldg., 3rd & Spring Sts., Los Angeles, Calif. Sample copy 10c. Established 1910.

**\$30,000.00** MINIMUM Per year for solution to electrical and mechanical movement problem. Name, address brings details. A. L. Armstrong, Eleven Eighteen East Twelfth Street, Long Beach, California.

**AVIATION**—Every person interested in this subject should make full use of the opportunity to learn aerodynamics with Alexander Klemin as his instructor, through his timely new book, "Simplified Aerodynamics." Heretofore this subject has been rather difficult for the thousands who need it but Klemin's method enables all to master it. Every pilot, mechanic, student needs this book. Pay postman price, \$5.50, and few cents postage when he delivers it. Order from Popular Mechanics Press, Room 892, 200 E. Ontario St., Chicago.



**LACEY'S Patent Sense.** Valuable book free. See ad page 134.

**TIME Counts** in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**LOW Cost manufacturing.** Large plant completely equipped for blanking, drawing, stamping and wire forming in any finish. Can save you money on your product. Our figures will convince. Eastern States Products, Box 721, New Haven, Conn.

**INVENTOR'S Universal Educator!** contains 800 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1.00 postpaid in U. S. A. Address District Co., 602B Huray Bldg., Washington, D. C.

**MANUFACTURERS** Everywhere seek new inventions to improve their product. Names of manufacturers and wanted inventions sent free on request. Write W. T. Greene, 913 Barrister Building, Washington, D. C.

#### PATENTS FOR SALE

**FOR Sale** invention. Mechanical device. Pool table ball rack. Outright or royalty. Write to John Granville, Minneola, Ohio.

**PATENTED—Mechanics' tool** for sale. Clamps on joint of floor or overhead. Holds siding, ceiling or floor plank down tight while being nailed. Attached or released instantly. Every carpenter will want one. Frank P. Johnson, Martinsdale, Texas.

**AUTOMOBILE** Hydraulic clutch. Patented. Sell on royalty basis or outright. Arthur Dixon, Lock Box 107, West Baden, Ind.

**PATENT** Pending on rubber toy. Unique nature. B. Omoto, Box 532, Green River, Wyo.

**TO Big companies.** Big money. Smoke preserver for stationary and marine boilers. Tested 178% economy. Steam seal used. No smoke. Cost cheap. J. B. Blanchet, 124 1/2 Avenue, Limousin, Quebec, Canada.

**OUTRIGHT.** Best offer, combined tool, two different size socket wrenches and one screw driver. Used by all mechanics. J. L. Hoffmann, 296 Congress St., Charleston, S. C.

**OUTRIGHT** Or royalty. Magazine sharing brush. Patent pending. Simple in construction. Efficient in use. John Rose, Stockbridge, Mass.

**NEW Invention.** Improved alarm chimes bobs, intruders, etc.; simple, effective, safe. Approved by police. Radi-O-Larm Co., 1291 Barr Bldg., Warren, Ohio.

**WOODTURNING** For amateurs. Excellent new instruction book just published for the amateur and home work shop owner. Contains all the needed information and is well illustrated yet published to sell at the low price of 25 cents postpaid. Send for your copy today. Mail remittance with your order. Popular Mechanics Press, Room 802, 209 E. Ontario St., Chicago, Ill.

**IMPROVED** Airship, safer, faster. H. J. Ross, P. O. Box 61, Farmingdale, N. Y.

**WANTED:** Inventions, patentable-unpatented. 22, Fond du Lac, Wis.

**FOR Sale—States** rights on "Automatic Milk Can Lifter." 45,000 sold in Minnesota. Sample free. Write quick. Rehr, Paulson, Hutchinson, Minn.

**DIECAST** Valve, replaces paste tube cap. Recorded, unpatented. Sell 15c. Birtley A. Hall, Hoodsport, Washington.

**FOR Sale—Very valuable** patents and inventions. G. Rogers, 52 Main St., Norwich, Conn.

**CASE** Opener. Cheap, profitable, good demand. B. Rockwood, 2821 Patterson Ave., Winston-Salem, N. C.

**VALUABLE** Automobile accessory. Patent pending. Erick Frankle, Fish Creek, Wisconsin.

**TIME Counts** in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**MANUFACTURERS** Looking for new inventions should write W. T. Greene, 913 Barrister Building, Washington, D. C.

**SHOP Notes** for 1931. Get your copy now. Only a limited edition. Contains all the articles published in the Shop Notes department of Popular Mechanics Magazine during 1930. Send 50 cents. If you want the set of Shop Note books consisting of 6 volumes including the 1931 number and 6 others issued previously we will send them C. O. D. for \$2.00. Popular Mechanics Press, Room 802, 209 E. Ontario St., Chicago, Ill.

#### MODELS AND MODEL SUPPLIES

**FROM** Your rough idea we design and build practical working model at lowest cost. We manufacture and sell, and pay you royalty. Our 25 years experience covers mechanical, electrical, photographic, musical, motion picture, phonograph, radio, etc., and also vending machines, packaging and counting machines, automatic sales machines, scales, gauges, amusement machines, amusements. Confidential service. Member Cleveland Chamber of Commerce. Write now. Wm. Gant Mfg. Co., 12300 Nott Road, Cleveland, Ohio.

**INVENTORS:** Send us sketch or crude model of your idea. Experienced craftsmen will develop it into a practical working model. 30 years of successful experience and thousands of satisfied clients. Confidential service guaranteed. Book references furnished. Free illustrated book: "Making Inventions Pay." Crescent Tool Co., Dept. 8-12, Cincinnati, Ohio.

**GASOLINE** Engine, two cycle type, 3 1/2"x3 1/2". Steam engine, boilers for model boats. Propellers, fittings. Catalog 15c. Anton Bababay, 212 Price St., Rahway, New Jersey.

**POWER** Models. Gasoline steam engines. Railway, steamship, boiler fittings, metals. Big catalog 25c. Charles Cole, Ventura, Calif.

**WHEELS** For covered wagons and coach models. Charles Schneider, Whitehall, Mich. Box one.

**TIME Counts** in applying for patents. See pages 132 and 133. Clarence A. O'Brien, Registered Patent Attorney, Washington, D. C.

**MODELS.** Tools, dies. General manufacturing. We carry complete stock aluminum, brass rods and sheets and plate. Modern Machine & Pattern Company, Terre Haute, Indiana.

**WE** Make working models for inventors and do experimental work and carry a complete stock of brass gears and model supplies. Send for catalog. The Pierce Model Works, Tinley Park, Ill.

**TOOLS.** Engine castings, practical drawings, supplies for model makers. Catalog 10c. Howard, 2417 N. Ashland Ave., Chicago, Ill.

**WOOD** Turning on the lathe. Both interesting and fascinating. Send for a copy of Mitten & Wohlers Course in wood turning. It gives you quickly a complete mastery of this manual art. 240 pages. Cloth. 144 plates. Sent C. O. D. For postman price \$1.50 and small amount postage upon delivery. Popular Mechanics Press, Room 802, 209 E. Ontario St., Chicago, Ill.

#### PATTERNS, WOOD AND METAL

**WILL** Make your patterns. Castings any material. Machine work. Models, tools, dies. Modern Machine & Pattern Company, Terre Haute, Indiana.

#### FOR MANUFACTURERS

**MANUFACTURERS** of cooking utensils of porcelain write Frederick Armstrong, Kirksville, Mo.

#### BLUE PRINTS

**BOAT** Blueprints. Folder 10c. Blueprint Company, 1037 East 146 Street, Cleveland, Ohio.

#### MANUFACTURING

**SPECIAL.** Machinery or parts, dies, tools, metal specialties, models, special gears, stock gears and model supplies. Send for catalog. The Pierce Model Works, Tinley Park, Ill.

**LOW Cost manufacturing.** Large plant completely equipped for blanking, drawing, stamping and wire forming in any finish. Can save you money on your product. Our figures will convince. Eastern States Products, Box 721, New Haven, Conn.

**METAL** Articles developed and manufactured. Model making. Reasonable price and first class workmanship. W. F. Meyers Company, Elkhart, Indiana.

**WIRE** Goods made to order. Cooley Mfg. Co., 2210 Carroll Ave., Chicago.

**ECONOMICAL** Manufacturing from sheet, bar, wire or tubing. Models, dies, special machinery. Swanberg, 5124 N. Kilbuck Ave., Chicago.

**SPECIALIZE** Complete manufacture, dies, tools, special machinery and patterns. Models made. Atlas Indicator Works, 821 W. Washington, Chicago, Ill.

#### SURVEYING INSTRUMENTS

**SAVE** Money by buying our rebuilt transit and levels. All fully guaranteed—add subject to field test. Cash or easy terms. Write today for list M-512. Warren-Knight Co., (Makers of "Sterling" Surveying Instruments), 136 N. 12th Street, Phila., Pa.

#### CASTINGS

**GRAY** Iron, malleable iron, brass, bronze, aluminum, white metal castings. Will make necessary patterns. Machine work. Modern Machine & Pattern Company, Terre Haute, Indiana.

**THAT** Concrete Job. Don't be afraid to tackle it. With the instructions found in the new edition of Popular Mechanics Concrete Handbook you can easily make 173 articles of utility and beauty ranging from ordinary steps to garden furniture. This book will be sent for only 96c plus postage C. O. D. Send your order today to Popular Mechanics Press, Room 802, 209 E. Ontario St., Chicago, Ill.

#### WELDING AND SOLDERING

**RAMMERS—Excellent** repassers, arc welders, buffers and grinders. Entirely rebuilt—guaranteed. Trial. Terms. Write Ken's Service, Box M-1213, Troy, Ohio.

#### ELECTRICAL

**"SPLIT** Second" electric clock movement, only \$2.32. You get \$5 to \$10 for it—send dime for "Make Big Money Electrifying Clocks." The Kumpel Clocksters, Guttenberg, Iowa.

#### BENDING MACHINES

**THE** Famous Hensfeld "Wrangleless" Universal Iron Bender is the last word in bending machines. Bends metal, cold or hot, into most any conceivable shape, including Eye Bolts and Automobile Spring Eyes. Bends up to 1" bars or 1 1/2" pipe cold. Also bends "Angle Iron." Thousands in use by all classes of trade, from the smallest shops to the largest railway systems. Write for circular and prices. Hensfeld Mfg. Co., Wisconsin, Minn.

#### MACHINE DESIGNING

**MACHINE** Designing and general drafting by experienced engineers. P. F. Rogge, Hanna, Terre, Mo.

#### BRONZE DIE CASTING MOULDS

**DO** Your own moulding soft metal ornaments. Send sketches or models for prices. Modern Art Service Company, Terre Haute, Indiana.

#### MACHINERY, TOOLS AND SUPPLIES

**12"x4" SIDNEY** Lathes, practically new, complete, \$225.00; No. 5 1/2 Fox plain milling machine, \$175.00; No. 60 Heald cylinder grinder, \$550.00; 24" Handey shaper, \$260.00; 10" new drill press, \$31.00; air compressor, complete with tank, motor, etc., \$100.00; battery charging outfit, complete, \$125.00. Write for catalog. Terms to suit. Cincinnati Machinery & Supply Co., 27 West End St., Cincinnati, Ohio.

**START** Business of your own, small investment required, doing chromium, nickel, copper, silver plating. This work is big demand. Information free. Electro Platers Supply Co., 28 West Second St., Cincinnati, Ohio.

**SUBSTANTIAL** Savings—used arc welders, buffers, grinders, platers, compressors, paint sprays. Entirely rebuilt, guaranteed, trial and terms. Write Ken's Equipment, Box M-1214, Troy, Ohio.

**LATHER** Castings. Kenelup & Son, 34, Carmel, Ill.

**KELLOGG** Air compressors, excellent condition, \$5.00. Taylor, 105 East 102nd Street, New York City.

**\$100.00 SCREW** Casting lathes. Inventors, amateurs, schools. Amphion 205-24th St., Milwaukee, Wis.

**INTERIOR** Wall decoration is a valuable new book covering all the modern methods of artistic wall treatments. Practical working instructions for both plain and decorative finishes are given. 451 pages, illustrated. Delivered to your door C. O. D. Simply pay postman \$3 and postage. Popular Mechanics Press, Room 802, 209 E. Ontario St., Chicago.



## ENGINES, MOTORS AND DYNAMOS

**EIGHT** 110 Or 32 volt lighting plants \$48.50; new 1/2 hp. gas engines \$10.75, ready to go, new six foot flexible miles self propelling \$1.50, mechanical orange juice extractors \$1.50, large stock electric motors, generators. General Distributing Co., Duluth, Minn.

**15—GASOLINE Engines:** 1/2 hp.—Brand new—Magneto—Starter. Guaranteed. Limited number. Harris Machinery, Minneapolis, Minnesota.

**BRAND New 1/2 hp. 25 cycle motor** \$8.50; 3/4 hp. repulsion motor \$14.00; 1/2 hp. dc. \$15.00; 1/2 hp. 32c. \$8.50. Large stock motors, generators, rotary converters, etc., at bargain prices. Queen City Electric, 1736 Grand Avenue, Chicago.

**NEW 3/4 Horse motor** \$6.50; used \$1.50; new 1/2 horse \$15.00; 12" steel saw tables with 1/2 horse motors \$21.50. Other motor, generator, air compressor bargains. Electrical Supplies Co., Dept. 12, 1825 Milwaukee Ave., Chicago.

**AUTO Engines** for stationary or portable power. We make necessary attachments. Thirty day trial. No cash down. California South Governor Co., 215 North Los Angeles St., Los Angeles.

**TIME Counts** in applying for patents. See pages 132 and 133. Clarence A. O'Brien. Registered Patent Attorney, Washington, D. C.

**ELECTRICAL Trade** shooting on the motor car and airplane. Don't trust to luck or guess work. Learn to make every motion count in testing and repairing. Send for our standard 491-page book for electricians and mechanics, 300 diagrams. Hundreds of practical tests. Pay postman \$1.00 plus postage when delivered. If outside U. S. remit when ordering. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

## FARMS AND FARM LANDS

**LAND Free** if planted to bananas. Bananas bear a full crop the second year. \$1.00 monthly will plant a five acre orchard, which should pay \$1,500.00 profit annually. All bananas ripen every day, you get your check every 30 days. A reliable company will cultivate and market your bananas for one-third. For particulars address Janita Plantation Company, Block No. 10, Philadelphia, Pa.

**QUAKERS—Timbered river land:** fishing, hunting, trapping, boating, pearling; \$200, \$10 monthly. Hubbard, 216 Grassman Bldg., Kansas City, Kansas.

**FREE Books** on opportunities in Minnesota, North Dakota, Montana, Idaho, Washington, or Oregon. Complete information on climate, crops, location for farm or suburban tract for grain, livestock, dairying, fruit, poultry—a home, independence, plenty of food, building, continuous employment. No occupation offers more to industrious capable men. Write E. C. Leach, Dept. 257, Great Northern Railway, St. Paul, Minn.

**OWN A farm** in Minnesota, Dakota, Montana, Idaho, Washington or Oregon. Crop payment or easy terms. Free literature; mention state. H. W. Ryker, 119 Northern Pacific Bldg., St. Paul, Minn.

**SELL Your property** quickly for cash, no matter where located. Don't pay big commission. Particulars free. Real Estate Salesmen Co., Desk B, Lincoln, Neb.

**TEN Dollars monthly** accrues five acres peaches, lings, figs, oranges. Guaranteed crop. 18c returns. Suburban Orchards, Dept. M, Miami, Fla.

**LAKEVIEW Florida farm.** 8 acres, oranges, peaches, shrubs; 4-room bungalow, large porch, garage; near city, borders lake, \$250 complete, part cash. Picture post. Free catalog 1000 bargains. Street Agency, 225-P Fourth Ave., N. Y. City.

**861 PRACTICAL Ways** to Reduce Farm Labor and Expense and Increase Income. One farmer writes he would not part with this information for \$100, if he could not duplicate it. Nothing experimental. These ideas have all been put to test and proven practical. Send today for a copy of our Handbook for Farmers and get ready to put these ideas into operation for your own benefit. Pay postman only 38 cents and the postage when he hands you the package Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

## WANTED—MISCELLANEOUS

**MAIL Us your discarded jewelry,** gold crowns and bridges, watches, diamonds, silver, platinum. Money promptly mailed. Goods returned if offer refused. United States Smelting Works (The Old Reliable) 28 So. State St., Dept. 71, Chicago.

## RABBITS

**BIG Profits—We show you how** to raise and sell rabbits. Information 10c. Gertrude Shipp Rabbitry, Watertown, Wis.

**ANGORA Woolers,** Cincinnati, New Zealand, reasonable. Sunnyside Fur Ranch, Vaughan, Ontario.

**STANDARD Rabbit Journal,** Milton, Pa. Special year 25c; sample dime.

**RABBITS And supplies.** Complete literature. Dr. Albert Facer, Inc., 115-X, Valley Stream, New York.

**RABBIT Raising** assuming large proportions. Learn how produced for food and fur. Send for reliable book by Frank G. Ashbrook, authority in U. S. Dept. of Agriculture. Price \$2.00. Sent postpaid upon receipt of price or C. O. D. anywhere in U. S. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

## MINK

**DAIK, Selectedly bred,** interior Alaska. Free information. H. Russell, Wadena, Iowa.

**ALASKAN.** Kind you want. Very reasonable. Brookside Mink Ranch, Bernardsville, N. J.

**BIG Money** made raising mink. Free information. Pennell Fur Farm, Dulken, Wash.

## DOGS AND PETS

**BEAUTIFUL,** Registered bull pups, \$15. Bulldogs. 501 Rockwood, Dallas, Texas.

**20 CHOWIE Select** cockhounds thoroughly trained, shipped on free trial. Pictures furnished. Kentucky Cockerhound Kennel, Kevil, Ky.

**KENTUCKY,** Coon, opossum, skunk, mink, squirrel, rabbit dogs, sold on approval. (Only dogs free.) Free literature. Strickland Farm Kennel, Hyman, Ky.

**POB Sale.** Minks, squirrels, raccoons, foxes, ferrets, muskrats, phasing, rabbits, skunks, wolf pups, coonesses. R. Tipton, Caladonia, Mich.

**FLYING Squirrels.** Ideal pets. 2, \$3. Prepaid. Shuler Home, Charleston, S. C.

**MAKE Poultry Pay.** Learn how to produce phenomenal profits by paying more attention to breeding of fowls. James Jordan, authority, tells how in his book, 415 pages. Over 300 illustrations. Price \$2.00. Sent postpaid upon receipt of price or C. O. D. anywhere in U. S. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.

## FOR SALE—MISCELLANEOUS

**NECKTIES!** Hosiery! Shirts! Reasonable prices. Palmer Bros. Outfitters, 31 Holly St., New Bedford, Mass.

**WATCHMAKERS** looking for sale at a bargain. R. Jaegermann, 5815 Eastern Ave., St. Louis, Mo.

**UNDERWOOD 5,** Standard office machine \$39.95. Checkwriter, duplicator, multi-graph, Dictaphones, bargain prices. Pruitt, 100 North La Salle, Chicago.

## ROOTS AND HERBS

**JUST Out!** Beautifully illustrated 64 page medicine man almanac. Contains over 500 well-known herb medicine recipes and Indian secrets for home use. 10c postpaid. Worth dollars! Botanicals, 143 West 115th St., Chicago.

## PERSONAL

**ASTROLOGY** will reveal your future. Special 12-page astrological forecast gives predictions—month by month—with exact days, dates and happenings for 1932 based on your sign of the Zodiac. Consult it today making any change in home or business affairs, signing papers, love, marriage, employment, travel, speculation. "Lucky days," etc. Know what to expect. Send exact birthdate with \$1.00. Franklin Publishing Company, 800 No. Clark St., Dept. 1239, Chicago.

**ARE You old at forty?** See our advertisement on page 50 of this issue. The Electric Thermal Company, 2148 Market Ave., Steubenville, Ohio.

**INCOME A faith healer,** Health for you and others. Arouse your latent Christian powers. Good income. Box 70, Watertown, Mass.

**GOLD Ink** written cards. Two cards 25c, 15 cards \$2.00. T. Kramer, 553 Albany Ave., Youngstown, O.

**HYPNOTISM** Simplified, technical terms reduced. Learn it the "common sense" method. \$1.00. Box 113, Granville, Ohio.

**GAIN** Amazing vitality, strength, vigor, etc., easily, quickly, harmlessly. Satisfaction guaranteed. Instructions \$1.00. Auckland Press, Box 252 F. Barton, Ohio.

**50 PERSONAL Correspondence cards,** 50 envelopes, printed, name, address, \$1.00. Select, 115 Hamilton, New Brunswick, N. J.

**TAP Dancing** course for beginners. Contains book; movements and tap dance routines. One dollar. "Bill" Kendrick, Box 129, Bismarck, North Dakota.

**YOUR Handwriting** reveals much. Trial reading, free. Elaine Rice, Commerce Station, Minneapolis, Minn.

**USE Shortcuts in Figures.** Save valuable time. The quickest ways of working all problems. Instructions for drilling yourself to be come rapid with figures. Complete, yet simplicity itself. Just write a postal for "Shortcuts in Figures." Pay postman \$1.25 and postage. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

**LIFE Reading.** 1932 forecast; advice on business, occupation, health, social affairs, etc.; complete \$1. Character outline 25c, send birthdate. M. Klein, 95 East St., Winnipeg, Man.

**TOBACCO Cure** formula 50c stamp. Blackbox, filling half cure \$2.00. Guaranteed. White-Box 1508, Chicago, Ill.

**25 LESSONS** in hypnosis, \$1.00 postpaid. J. Tishberg, Proctor, N. J.

**YOU Need a better grip on mathematics?** Ask us to send you a copy of "Mathematics for the Practical Man," only \$1.50. By common sense methods it removes the mysteries and difficulties to algebra and calculus are made simple. Assuming your knowledge is limited to arithmetic you quickly and easily gain a working knowledge of algebra, geometry, trigonometry and calculus. Simply pay postman when he hands you the package. Address Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

## MISCELLANEOUS

**LEARN Today—earn tomorrow.** Name plates, house numbers, signs, tinney system. Paint signs, pictures, without press, type or machinery. Samples 10c. Bradley, 115 W. Main, Springfield, Ohio.

**SEASHELLS:** Beautiful collection, over 50 varieties, postpaid \$5.00. H. Schenck, 100 Post St., Berkeley, California.

**MICROFILS** Resilvered at home costs near 5 cents per square foot; you charge 75 cents. Profitable business plating microfilms, redactors, labware, stores, refashioning rest-awares, etc. Outfits furnished. Details free. Write Sprinkle, Placer, 238, Marion, Indiana.

**MOSS Acetate—ring sets,** \$1.00, \$2.00; brooches, chains, \$2.50. Satisfaction guaranteed. 151 Lewis, Billings, Montana.

**HERE'S A money-saver—Scientific American—Review of Reviews,** both one year \$5.50, save \$1.50. Lists free showing startling reductions on other magazines. Porter, 6115a-115th St., Richmond Hill, N. Y.

**KEYS Lost,** easily found if registered. Members everywhere. Registration (entire set) 25c. National Locksmiths Ass'n. Charles Hays, Denver, Colo.

**TRANSFERRING Liquid—Takes** any pictures or print off bills—magazines—funnies, etc. 25c bottle, formula 25c, ink 50c. No stamp. Church, Bristol, New Jersey.

**AMATEUR Cartoonists—earn** \$25.00 week, spare time, copying cartoons for advertisers. A-M Syndicate, Argyle, Wis.

**COMPLETE Sets** of castings for your home shop. Lathes, table saws, shaft hangers, etc. Assemble them yourself. Extraordinarily low priced. Learn Fletcher, Ocean Beach, Calif.

**TATTOOING** outfits, supplies. Illustrated list free. "Waters," 305 Post-road, Detroit.

**AMATEUR Cartoonist:** Sell your work. Write Smith's Service, P.O. 1194, Wenatchee, Wash.

**FLYING Simplified—Just out.** Here is a remarkable non-technical book for beginners, prospective or advanced students that teaches in an easily understood manner all you can need to know to master the art of flying. Will save you many dollars when you learn to fly. Pay postman only \$1 and postage when book is delivered at your door C. O. D. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago.





## "How I Licked Wretched Old Age at 63"

I Quit Getting Up Nights — Banished Foot and Leg Pains . . . Got Rid of Rheumatic Pains and Constipation . . . Improved My Health Generally . . . Found Renewed Strength

"At 61, I thought I was through, I blamed old age, but it never occurred to me to actually fight back. I was only half-living, getting up nights . . . constipated . . . constantly tormented by aches and pains. At 62 my condition became almost intolerable. I had about given up hope when a doctor recommended your treatment. Then at 63, it seemed that I shook off 20 years almost overnight."

### Forty—The Danger Age

These are the facts, just as I learned them. In 65% of all men, the vital prostate gland slows up soon after 40. No pain is experienced, but as this distressing condition continues, sciatica, backache, severe bladder weakness, constipation, etc., often develop.

### PROSTATE TROUBLE

These are frequently the signs of prostate trouble. Now thousands suffer these handicaps needlessly! For a prominent American Scientist after seven years of research, discovered a new, safe way to stimulate the prostate gland to normal health and activity in many cases. This new hygiene is worthy to be called a notable achievement of the age.

### A NATIONAL INSTITUTION FOR MEN PAST 40

Its success has been startling, its growth rapid. This new hygiene is rapidly gaining in national prominence. The institution in Steubenville has now reached large proportions. Scores and even hundreds of letters pour in every day, and in many cases reported results have been little short of amazing. In case after case, men have reported that they have felt ten years younger in seven days. Now physicians in every part of the country are using and recommending this treatment.

Quick as is the response to this new hygiene, it is actually a pleasant, natural relaxation, involving no drugs, medicine, or electric rays whatever. The scientist explains this discovery and tells why many men are old at forty in a new book now sent free. In 24-page, illustrated form. Send for it. Every man past forty should know the true meaning of those frank facts. No cost or obligation is incurred. But act at once before this free edition is exhausted. Simply fill in your name below, tear off and mail.

### THE ELECTRO THERMAL COMPANY

2148 Morris Ave. Steubenville, Ohio.

If you live West of the Rockies, address The Electro Thermal Co., 303 Van Nuys Building, Dept. 21-B, Los Angeles, Calif. In Canada, address The Electro Thermal Co., Desk 21-B, 63 Yonge St., Toronto, Can.

THE ELECTRO THERMAL CO.,  
2148 Morris Ave., Steubenville, Ohio.

Name.....

Address.....

City.....State.....

When writing to advertisers please mention Popular Mechanics



## Stop!

Using Tobacco

Perhaps you've tried to stop using tobacco only to find that the habit has such a hold on you that you gave up trying.

You know, better than anyone else, whether tobacco is hurting you, and if it is, that sooner or later, it will undermine your health. Heart trouble, indigestion, dyspepsia, nervousness, insomnia, poor eyesight—these and many other disorders can often be traced directly to the use of tobacco, according to good medical authority. Besides it is an expensive, utterly useless habit.

## Let Us Help You To Banish The Habit

No matter how firm a grip tobacco has on you—no matter whether you've been smoking cigars, pipe or cigarettes or chewing plug or fine cut for a month or 60 years—Tobacco Redeemer will in most cases remove all craving for tobacco in any form in a very few days. It does its work so quickly that all tobacco "hunger" is gone almost before you know it. The desire for a smoke or chew usually begins to decrease after the very first dose.

Tobacco Redeemer contains no habit-forming drugs of any kind—it is in no sense a tobacco substitute. It does not cause the slightest shock to the nervous system; on the contrary, it often helps to quiet the nerves and make you feel better in every way.

### SEND for PROOF

Get our free booklet. It tells you all about the deadly effects of tobacco and how easy it is now to quit. We will also send you copies of letters from confirmed users telling how this simple, home-treatment freed them absolutely from the habit. Just mail coupon—or a postal will do.



### NEWELL PHARMACAL CO.

Dept. 999 St. Louis, Mo.

Send me without obligation to me in any way, proof that Tobacco Redeemer will positively free me from the Tobacco Habit or my money will be refunded.

Name.....

Street and No.....

Town.....State.....



# I'M GLAD I'M AN ARTIST



"When I see fellows in other lines being let out I'm glad I trained my liking for drawing and became an artist. A few years ago I was just like the rest. I had a job and nothing more.

"Now I'm a trained artist—and I've quit worrying. Every Tom, Dick and Harry can't fill my shoes. There aren't so many trained artists—and each of us has his individual style. Art training has certainly helped me to get up above the crowd. If you like to draw, take my advice and enroll now with the Federal Schools and train your talent."

Through the Federal Course you can learn Illustrating, Cartooning, Designing, Lettering, Show Card Writing at home. More than fifty famous artists, masters of

modern methods, contribute their experience to this course. For 15 years Federal Students have made good. Many Federal Students are now earning \$2500 to \$6000 a year—some even more.

Why be smothered in the crowd when Federal Training may help you to make a better place for yourself? If you like to draw, you may have art talent. Without obligating yourself in any way find out how the Federal Schools can help people with art ability. This may be your answer to the job problem.

## Free Vocational Test

Fill in coupon below and mail for Free Vocational Art Test today. The way to make money is to train your talent. Find out about your ability.

## THE FEDERAL SCHOOL of ILLUSTRATING

12131 FEDERAL SCHOOLS BUILDING

MINNEAPOLIS, MINNESOTA

Federal School of Illustrating

12131 Federal Schools Building, Minneapolis, Minnesota

Please send me free book, "A Road To Bigger Things," and Standard Art Test.

Name \_\_\_\_\_

Age \_\_\_\_\_ Occupation \_\_\_\_\_

Address \_\_\_\_\_



When writing to advertisers please mention Popular Mechanics



# OIL HEAT



## Special Dealer Offer

Distributors wanted! At once. Willing to make SPECIAL OFFER IF YOU ACT NOW. Small investment. You can make some real money right now. If you act immediately.

## World's Lowest Priced

Cheapest to Operate  
Power OIL BURNER

1932  
Models

NEW LOW PRICES

Here's real news. Buy ready-to-go oil and heat forever. This new, fully automatic and guaranteed oil burner BURNS THE CHEAP FUEL OILS. Our new low cost method of manufacturing makes possible the greatest price reduction in years. It has revamped our dealers with orders. And now the new 1932 models just announced bring you still more amazing improvements.

1. A new packaging using that requires no adjustment. Quieter than ever.
2. Radio Proof Coil.
3. All Brass Tubing that lasts forever.
4. NEW STEEL ELECTRODES containing higher percentage of tungsten to give extra long life.
5. NEW Refractory at New Low Prices.

### SENSATIONAL NEW PRINCIPLE

A new method of diffusing air and oil almost instantly heated low speed air velocity creates an

instantly heated low speed air velocity creates an

instantly hot, easy, noiseless flame moving upwardly through the central portion of the combustion chamber utilizing every drop of heat. Clean, noiseless, maintenance free. Reduces heat waste and cuts your fuel bill.

### FULLY AUTOMATIC

A fully automatic burner system that watches your heating plant continuously. Carries the temperature within one degree at any point between 50 and 80. Absolutely safe. Can't explode. Quiet. Fits instantly into your present heating plant. Built good, of the best material and workmanship to eliminate service.

### SPECIAL OFFER

Don't get off this wonderful convenience longer. It's a fine, highly improved, work safe and costs considerably less than at a far lower price than ever. Send at once for special offer. Tell us the type of heating plant and number of rooms you have to heat. We'll send it.

Underwriters' Laboratories.

150 Union Street, Dept. A  
GRISWOLD, IOWA

# LACO

## OIL BURNER CO.

ONE OF THE WORLD'S LARGEST MANUFACTURERS OF OIL BURNERS

## FREE Radio Handbook

Write today for your copy of the new Radio Association handbook. Shows you easy ways to make money in Radio. Tells you how our members are making up to \$300 an hour part time. Write for Membership Plan which costs not over 20¢ a year and FREE RADIO HANDBOOK.

RADIO TRAINING ASSOCIATION OF AMERICA  
Dept. PM-12 4513 Ravenswood Ave., Chicago

## 34 Lesson

## Drawing Course \$2.98

The biggest value you ever saw advertised anywhere . . . . .



Haven't you often wished that you could draw cartoons, illustrate some idea, sketch some pretty face, etc.? You can do all of these things. One of America's most famous Cartoonists and Illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning, consisting of 34 lessons with over 500 illustrations, within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of \$2.98, the cheapest price ever known for a high-grade, home study course. Learn to draw. It is a big asset, no matter what field you are in.

### Send No Money

Just order the course and on arrival \$2.98 pay postman plus a few cents postage, payment in full for the entire Course and Drawing Book. If not entirely satisfied, return within five days and we will refund Money. Address: LEPPER SCHOOL OF DRAWING, Dept. 1124-C, Chattanooga, Tenn. Orders from outside the U. S. A. are payable \$3.28 each with order.

If you order the course at once, we will include a drawing card, consisting of artist's pencils, pens, paper, eraser, thumb tacks, etc., enabling you to go to work without any additional cost.



## Know Electricity as Experts Know It—and Get an Expert's Pay!

Make no mistake about it—there are big jobs in electricity ready for you when you're ready for them. Thousands of men who have the Croft Library know that to be a fact. The Library itself, on a FREE TRIAL BASIS, can prove it to your absolute satisfaction.

## The New Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of successful experience. Written so that the beginner can easily understand it, yet so solid, so thorough, that it is the daily guide of 80,000 electrical workers and engineers. Could tell you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—illustration in its every phase—the latest and most improved methods of lighting—house and lamp wiring, etc.—how to do a complete job, from estimating it, to completion.

### No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven, valuable for ten days' Free Examination. We take all the risk—pay all the charges. You assume no obligation—pay nothing unless you decide to keep the books. Then \$1.50 in ten days and the balance at the rate of \$1.50 a month. Send the coupon NOW and see the books for yourself.

### FREE EXAMINATION COUPON

McGraw-Hill Book Co., 370 Seventh Ave., New York

Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the special price of \$18.00 is paid. If not wanted, I will return the books post-paid. (To insure prompt shipment write plainly and fill in all lines)

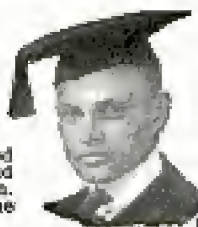
Name.....  
Home Address.....  
City and State.....  
Position.....  
Name of Company..... P.M. 32-33

When writing please mention Popular Mechanics



## Choose as Your Profession ELECTRICAL ENGINEERING

Electricity offers a brilliant future. Good B. S. DEGREE paying positions the world over open to trained men. IN 3 YEARS Attain S. of E.—use of the foremost electrical schools.



### PRACTICAL ELECTRICAL EDUCATION

Learn by the thorough, approved, scientific S. of E. unit system. Specialists for 28 years. Other courses given: A.C. and D.C. Armature Winding—Practical Electricity—Drafting—Electrical Refrigeration—Radio Technician—Commercial Radio Engineering and Commercial Electrical Engineering.

**Earn While** Earn part of your expenses. **New Term** Scholarship Loan Fund for Every 3 Mos.

**You Learn** those who need help. **Low** tuition fee. **Board and room** Next Jan. 4th

reasonable. Daily Broadcasting WISN. Western Key Station WBSO. School Orchestra. Fraternities.

**WRITE FOR PHOTO STORY.** Write today for free, illustrated photo story, S. of E. Unit System and Earn While You Learn Plan. State age, education and course interested in.

## SCHOOL of ENGINEERING of Milwaukee

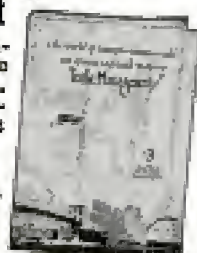
Dept. PM-112, 521 E. Wells Street Milwaukee, Wis.

## OPPORTUNITIES IN Traffic Management Become a Traffic Expert

The opportunities in traffic management are limited only by the boundaries of the business world. The trained traffic man is in demand by transportation systems and by industrial organizations.

**Three Detroit Firms  
Pay Their Traffic Managers  
Over \$20,000 a Year**

Prepare for this growing, profitable profession at home in your spare time under supervision of traffic experts. Low cost; easy terms. Thru the LaSalle Problem Method you learn by doing. Valuable 64-page booklet free. Send for it Now.



**This Book  
FREE!**

LaSalle Extension University, Dept. 1264-T, Chicago

## EARN MECHANICAL DENTISTRY

**Earn Big Money—Men Needed Everywhere.** This money-making business easily learned in a few months in day or evening sessions. Practical training. Individual instruction. Easy terms. School is highly endorsed. Write NOW for free catalog P and special tool offer. Address NEW YORK SCHOOL OF MECHANICAL DENTISTRY, 125 W. 31st St., New York



**\$100 to \$500 A WEEK IS EARNED BY  
CARTOONISTS TODAY**

Do you like to draw cartoons? Our interesting self-instructive course will teach you. Course consists of 30 lessons illustrated with over 300 drawings. Sent to you complete for \$1.00. Outside U.S.A. \$1.10. **SCOVELL ART STUDIOS, Box 610, Hollywood, California**

Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

## Inventor Cuts Shoe Resoling Cost To 8¢ EACH!

A new kind of resoling material has now been perfected which enables

anyone to resole his own shoes at home for only 8¢ each. Takes only a few minutes to apply, wears like leather, makes soles waterproof and durable. Entirely unlike ordinary materials.

**AGENTS!** Cash in on hard times, saving people shoe costs with Luxole. The inventor will send samples without risk. He also offers profits as high as \$15 to \$30 a day, demonstrating in full time or spare hours. Write **H. A. Visel, Dept. W-3110, Elkhart, Indiana.**

## Genuine UNDERWOOD Below 1/2 Mfg's. Original 2 PRICE (Refinished)



Famous  
Model No. 5

**Now Only \$39.90**  
**DOWN**



Think of it—over 2 million buyers paid \$102.50 (cash) for this model No. 5 now offered direct-to-you at way below 1/2 original price—and on easiest terms besides. Positively the greatest bargain ever offered. Accept the special 10 day trial offer and be convinced. See the next, perfect work it does—compare its bright, shiny newness without risk. Recognized as the finest, strongest typewriter built.

## Easy Terms—only 10c a day

Here is positively the chance of a lifetime to own a World-famous Standard Underwood No. 5 completely refinished like new at the very lowest price and easiest terms. All complete with modern

### Learn Touch Typewriting



Learn touch typewriting fast! Complete (home study) course of famous Van Sant system gives you with this offer. Fully illustrated—easily learned.

### 10 Day Trial

You save over \$60 by quick action. These genuine guaranteed Underwoods now only \$39.90 (cash) while limited supply lasts. Only \$1 down brings the Underwood for 10 days' trial. If you keep it—only 10¢ a day soon pays for your Underwood on our new low price and easiest terms. Send at once before this special offer is withdrawn. Remember every machine fully guaranteed and sent on 10 day trial.

International Typewriter Exch.  
231 W. Monroe St., Chicago, Dept. 1201

I enclose \$1 deposit. Send Underwood No. 5 (F.O.B. Chicago) at once for 10 days' trial. If I am not perfectly satisfied I will return it express collect and get my deposit back. If I keep it I will pay \$9 a month until I have paid \$44.90 (firm price) in full.

Name.....  
Address.....  
City.....State.....

When writing to advertisers please mention Popular Mechanics



# Try my HEALTH MAKER IDEA



*Less time than it takes to shave*

**DON'T** be a physical weakling, run down, underweight! **FIVE MINUTES** a day with the **VITABOAT** will build you a magnificent physique; cover your shoulders, chest and legs with smooth rippling muscles you can be proud of. *Start now today to make a new man of yourself.* The **VITABOAT** will make you husky, powerful, **RENEW** your vigor and stamina—equip you to enjoy life to the full! Send coupon for description of our new low-priced **VITABOAT**. Learn what this light, compact rowing machine will do for you in **RENEWED HEALTH AND STRENGTH.**

**Send for FREE booklet**

J. W. COOPER & CO., Dept. F12  
377 4th Ave., New York

Please send me your Free booklet telling how the Vitaboat will make me strong and husky and renew my physical energy. Also explain your free trial and easy terms.

Name .....

Address .....

City .....



## High School Course in 2 Years

This simplified, complete High School Course, specially prepared for home study by leading professors, meets all requirements for entrance to college, business, and leading professions.

### 20 Other Courses

Over 200 noted Engineers, Business Men, and Educators helped prepare the special instruction which you need for success. No matter what your inclinations may be, you can't hope to succeed with-

out specialized training. Let us give you the practical training you need.

**American School**  
Drexel Ave. and 58th St.  
Dept. H-947, Chicago

**Money Back When You Finish If Not Satisfied**

American School, Dept. H-947, Drexel Ave. and 58th St., Chicago  
Send me full information on the subject checked and how you will help me win success in that line.

- .....Architect
- .....Building Contractor
- .....Automobile Engineer
- .....Civil Engineer
- .....Structural Engineer
- .....Business Manager
- .....O. P. A. & Auditor
- .....Bookkeeper

- .....Electrical Engineer
- .....General Education
- .....Lawyer
- .....Mach. Shop Practice
- .....Mechanical Engineer
- .....Steam Engineer
- .....Draftsman & Designer
- .....High School Graduate

Name .....

Age .....

St. and No. ....

Town .....

State .....

When writing to advertisers please mention Popular Mechanics



**FREE! FREE!**  
TIRE GAUGE  
WITH EACH ORDER  
FOR 2 TIRES

MON-THAT TIRE PRES-SURE  
MEASUR-SIDE WALL OF TIRE

**SAVE ON TIRES**

**12 MONTHS SERVICE**

**New LOW PRICES**  
ON GOOD YEAR  
GOODRICH-U.S.-FIRESTONE  
FISK AND OTHER TIRES

### LOWEST Prices on Earth!

Thousands of satisfied tire users all over the U.S.A. will vouch for the **LONG, HONORABLE SERVICE**, under severest road conditions of our standard brand tires, recommended by the **ORIGINAL SECRET YORK PROCESS**. To introduce this accurate tire value to you, this big remarkable company offers, **ABSOLUTELY FREE** a modern tire gauge with each 2 tires ordered—new tube pressure through side wall of tire! A life-time free—no dirt. **DUE 10 YEARS IN BUSINESS** makes it possible to offer tires at **LOWEST PRICES** in history. **Guaranteed to give 12 months' service.**

**Don't Delay — Order Today**

**CORD TIRES**

**Size** **Tires** **Tubeless** **Size** **Tires** **Tubeless**

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

30x3.5 \$2.20 \$1.00 30x4.0 \$2.30 \$1.10

## ENGINEERING and ARCHITECTURE

**INTENSIVE PRACTICAL TECHNICAL COURSES** in Electrical, Mechanical, Structural, Architectural, Estimating, Design, etc., diploma in 1 yr. Also shorter courses in Electricity, Power Plant, Radio, Television, Electric Refrigeration, Drafting, Welding, Non-destructive examination. **LOW TUITION.** Expert instructors, Scientifically equipped laboratories. Free lifetime employment for graduates. Part-time work during attendance. 32nd year. Write for catalog. **FINLAY ENGINEERING COLLEGE**  
1001 A Indiana Avenue KANSAS CITY, MO.



### Winchester Take-Down Model 55

Calibres .25/.35 and .32 W. S. A new sporting rifle that embodies the dependable action of the Winchester, in a strong light weight (8 1/4 lbs.). Fine for deer and similar game.

**\$24.95**

**"Extra Special"**

**Original price \$44.70**

Brand new; 24 inch tapering barrel; sporting rear sight; Lyman gold bead front sight; capacity 5 shots; selected walnut stock. Shipped in original, sealed factory boxes. Either calibre at our "Extra Special"—\$24.95. Only a limited quantity. Order Early. Write for NEW illustrated catalog "W" Shotguns, Rifles, Binoculars, etc. **HUDSON SPTG. GDS. CO., 152 Warren St., New York**

## free RADIO CATALOG



New 10th Anniversary Catalog just out! 144 pages crammed full of bargains. Everything new in radio at lowest wholesale prices. Replacement parts, tubes, kits, speakers, accessories, lamps, etc. 3, 5 and 10 tube Super-Heterodynes, etc. Many new, nationally advertised radio manufacturers. Write for this FREE 144 page book today.

**WHOLESALE RADIO SERVICE CO.**

34 Vesey St., Dept. M-11, New York, N.Y.

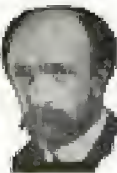
*new 1932 bargains*



## Stop Making Mistakes in English

Wonderful new way to improve your English. No rules to memorize. No hard study. Grammar, spelling, punctuation, and expression, taught in 15 minutes a day—at home. Self-correcting feature makes it fascinating as a game. Write today for free booklet, "How You Can Master Good English in 15 Minutes a Day."

Sherwin Cody School of English, 512 Searle Bldg., Rochester, N. Y.



## TRICKS WITH ELECTRICITY!

How to be a "human dynamo"—make electric lights obey voice—do spirit rapping and fortune telling by electricity—make all kinds electric novelties and devices at home. "Electric Fun". Fascinating book telling how to do 200 stunts with ordinary house current (110 volts A.C.) \$1.00 postpaid.

CUTTING & SONS Dept. 102 CAMPBELL, CALIF.

## Wireless (Radio)

and Morse telegraphy taught thoroughly. School, oldest and largest endorsed by Telegraph, Radio, Railway and Government officials. Unusual opportunities. Expenses low—can earn part. Catalog free.

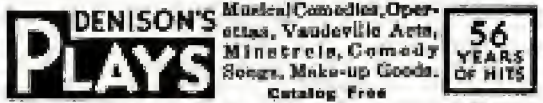
DODGE INSTITUTE, Jones St., Valparaiso, Indiana.



## LEARN WATCHMAKING

and become independent. We help you secure a position. Easy to learn. Send for FREE CATALOG.

ST. LOUIS WATCHMAKING SCHOOL Dept. S, ST. LOUIS, MO.



T.S. Denison & Co. 623 S. Wabash, Dept. 9, Chicago

## New Food Idea Pays Big Profits!

Men! Women! Investigate the wonderful NEW Brown Hobby CEREAL! BAKED Doughnut. Sells like wildfire! You can easily make \$50 week spare time; \$3000 to \$8000 year full time. Investment small. No experience needed. Write today for big special offer. Food Display Machine Corp., Dept. 3-M, 640-610 N. Dearborn St., Chicago

## NERVES?

Are You Always Cashed? Fatigued? Worried? Glazed? Paralyzed? Constipation, indigestion, cold, weak, dizzy spells and headaches are caused by NERVE EXHAUSTION. Drugs, food and medicine cannot help, and you never! Learn how to regain Vigor, Calmness and Self-Confidence. Send 25c for this amazing book.

RICHARD BLACKSTONE, R-712 FLATIRON BUILDING, N. Y. C.

## WHAT EVERY ELECTRICIAN WANTS TO KNOW!



\$1.50 A Vol.

Is easily found in AUDEL'S NEW ELECTRIC LIBRARY. Electricity made simple as ABC. Up to date trade dope for the expert and ALL electrical workers.

Questions, answers, diagrams, calculations, underwriter's code, design, construction, operation and maintenance of modern electrical machines and appliances FULLY COVERED.

Audel's NEW library is necessary wherever electricity is used. Available at small cost, easy terms.

BOOK-A-MONTH service puts this NEW electric information in your hands for 50 a day.

Write TODAY for Details Folder and FREE TRIAL OFFER.

Theo. Audel, 65 W. 23rd St., New York

NAME.....

ADDRESS.....

## BIG FUN-BIG MONEY



## Learn to MOUNT BIRDS AND ANIMALS

## Be a TAXIDERMIST

Learn this WONDERFUL new, fascinating and PROFITABLE art at home by mail. This old famous school with over 100,000 students GUARANTEES success. Thousands of Popular Mechanics readers have already enrolled. Mount and preserve GAME ANIMALS AND BIRDS like life. Mount common and domestic animals in highly amusing and human-like groups. The actual squirrel showman, MOUNTED AND DRESSED up, cost but a few cents for materials, but sold for \$50 for a window display. Rabbits, frogs, mice, cats, pigs, sparrows, pheasants—all can be mounted in funny and interesting groups, imitating human situations. Great fun, tremendously fascinating, extremely profitable.

## Quickly Learned by Mail

Men, women, boys, all learn easily and quickly, at home BY MAIL, from our marvelously clear course of 40 lessons. Begin ACTUAL WORK with the first lesson. You become a TAXIDERMIST ARTIST, well known and popular. You learn an art of vast interest, and one that will turn spare time to big profits.

## Hunters—Anglers!

Preserve your trophies. Save your fine specimens. Have your own MUSEUM. Also mount for others and sell your spare specimens at fancy prices. Every SPORTSMAN and Nature Lover MUST know taxidermy, or lose half the pleasure and profits of the sport. Taxidermy is sweeping the country. INVESTIGATE! Send right NOW for our free BOOK.

## A Business of Your Own

Do you want or NEED to MAKE MORE MONEY? Here is your OPPORTUNITY. Make \$50 to \$200 a month from SPARE TIME. Or open a TAXIDERMIST SHOP. Have a life-long business of your own, one that is high grade and that can earn for you \$4,000 to \$4,000 a year. All customers bring their TROPHIES MOUNTED. Business will quickly grow into this great PLEASURE AND PROFIT ART TODAY. Be all means write for our interesting, new,

**FREE BOOK:** 45 pages, dozens of pictures of mounted game specimens, and full particulars about our course and how YOU can become an EXPERT TAXIDERMIST, at home in SPARE TIME. Send the COUPON RIGHT NOW—TODAY. State AGE.

Send Coupon Today!

## FREE BOOK COUPON

NORTHWESTERN SCHOOL OF TAXIDERMISTRY, 3375 Elwood Building, Omaha, Nebraska

Gentlemen: Please send at once your free 45-page book on Taxidermy with our tiny obligation on my part. Tell me how I can learn Scientific Taxidermy at home.

Name.....

Address.....

When writing to advertisers please mention Popular Mechanics



## WANTED—A New Article

The President of a large manufacturing company, and one of the best business men I know, told me yesterday that he would buy or take over on royalty to manufacture and sell something that drug stores, hardware stores, chain stores and mail-order houses would use in large quantities if he could find something that really is both new and good, and which might be made popular by advertising—a "staple" rather than a "gim-crack."

He prefers it to be made of metal or glass or plastic, but he doesn't want another flat-iron, or just another slightly-improved anything . . . but something really new that is protected by U. S. patent or a sound Patent Application. It might sell for a dollar, or maybe twenty-five dollars.

This client has left it to me to find the right article and I am telling as near as I can what he wants so that anyone who reads this and who thinks he has it may tell me so.

I am an officer of a well known business firm in New York doing business with many large manufacturers of many different types of products, all of which for the present I must ask you to believe for I simply cannot, in fairness to myself or to you, sign my address and risk having numerous disappointed callers waiting in line, so I will use the Box No. of our Advertising Agency.

If you have this new patented product, or think you have, write me about it telling frankly what it is and the patent situation. . . . I can't steal it or in any way harm you, and besides I wouldn't if I could. Don't write me evasive letters for appointment without telling me your product, or any kind of evasive letter, for first I must know clearly what we are to consider. And the man with the right product will not hesitate to be specific for he will realize that in due course I want to see it (and him) as much as he wants to sell it.

There will be no advance fees asked, so don't worry your head over that or over anything else except having "the thing to fill the bill." We will try to do the rest for you.

Now, if we understand each other well enough to really get started, please feel free to do what I have suggested and write me (I will get it unopened).

F. L., Box 47, Trinity Station, New York



# DRAFTING

## BOOKS SENT FREE!

ON APPROVAL

### For Beginners

Written, so you can understand every word, by 22 famous engineers and architects. Deluxe flexible binding, nearly 2,000 pages, 156 blueprints, charts and diagrams; prepares you for a good drafting job in mechanical or architectural lines. Sent for 10 days' free use if you mail coupon immediately.



### 5 Volumes New 1934 Edition

Only 15 minutes a day with these WONDER BOOKS will prepare you for a good drafting job in less than a year. Mechanical and architectural drafting from simple straight lines to important complex plans. A step at a time! Built especially for beginners, for men with only grammar schooling. Drafting room practice. PLUS ENGINEERING, made easy and clear. Includes complete course in blue-print reading.

### Big Field Big Demand Big Pay

Competent drafters are greatly needed right now in all building and manufacturing lines at \$20.00 to \$100.00 a week. That's just the beginning—FOR DRAFTSMEN HAVE THE BEST CHANCES FOR ADVANCEMENT. Pleasant, fascinating work, may be learned and so. Learn quickly with these books—read them for a set FREE and see for yourself.

A girl's continuing membership in the American Technical Society now gives her all readers of this famous syndicate of drafting. Many say that it is worth more than the cost of the books.

Complete set of drawing instruments if you send for these drafting books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Real \$10 value, but free to you with these books.

AMERICAN TECHNICAL SOCIETY  
Dept. D-913, Brossel at 34th St., Chicago, Ill.

American Technical Society, Dept. D-913, Brossel at 34th St., Chicago, Ill.  
Send for 10 days' free use New 5 volume set of drafting. I will pay the few cents delivery charges. If I wish, I may return them in 10 days and see you nothing but if I decide to keep them I will send \$2.00 after 10 days, then only \$2.00 a month, until \$10.00. The special introductory price, is paid. Send 1934 edition and include drawing instrument.

Name.....  
Address.....  
Employer's.....  
Address.....

When writing please mention Popular Mechanics

## JOBS NOW OPEN



No Education or Experience  
Needed to Learn

### TOOL & DIE MAKING MACHINIST TRADE & DESIGNING AUTOMATIC SCREW MACHINES

Learn these big paying trades easily and quickly in our modern shops on finest equipment. Expert instructors train you on actual work done for large manufacturers. No books. No lessons. Day or eve, instruction. We help place you while learning and after graduation. Thousands of Allied trained men are now making big pay. You can too. Don't delay. Write now for FREE catalog.

ALLIED SCREW MACHINE CO., Inc.  
School of Mechanical Trades  
524 W. Monroe St. Chicago, Ill. Dept. 1022

## BEDFORD YMCA TRADE SCHOOL


### Caterpillar Tractor Mechanic

Aviation Mechanic  
Flying  
Airplane Welding  
Airplane Drafting  
Air Navigation  
Starting, Lighting, Ignition  
Auto Mechanic  
Machine Shop, Electric Welding  
Oxy-Acetylene Welding  
Radio Mechanic, Air Brush  
Mechanical, Architectural Drawing  
Sign Painting, Show Card Writing  
Talking Pictures, Western Electric  
Commercial Art, Fine Art  
DAY AND EVENING SESSIONS  
Write for Catalog 50

Brooklyn Engineering Institute  
(Operated by Bedford Y. M. C. A.)  
1125 Bedford Avenue, Brooklyn  
New York City

## Government Positions

Clerk Carriers, Rural Carriers, Railway Mail Clerks, Postmasters, Department Clerks, and many others. Splendid salaries, easy work, vacation with pay. Only common school education required. Examinations often. 44,817 appointed last year. Send for our Civil Service Catalog No. 6. COLUMBIAN CORRESPONDENCE COLLEGE, Washington, D. C.



## Learn to PAINT SIGNS and SHOW CARDS

We quickly teach you to paint, or at school, in spare time. Business demand. Big future. Every-thing work. Color and lettering school.

EARN \$50 TO \$200 WEEKLY

Only Windsor, Ill. home-study institute, made \$12,000 from 100 students in one year. Take them. N. Y. state \$25 for a photo card, Crawford, N. C. writes: "Earned \$200 while taking course." Write for complete information.

DETROIT SCHOOL OF LETTERING  
154 Michigan Ave. Det. 1420 Detroit, Mich.

## LUCKY TIGER

### FOR HAIR AND SCALP!



A single application stops that miserable itching. A single bottle cures scalp irritations. A Proven Germicide, delicately perfumed, safe for adults and children. World's largest seller at Druggists, Barbers, Beauty Parlors.

**GUARANTEED**

## NO JOKE TO BE DEAF

### — EVERY DEAF PERSON KNOWS THAT

George P. Way made himself hear, after being deaf for 24 years, with Artificial Ear Drums—his own invention. He wore them day and night. They stopped head aches and ringing ears. They are invisible and perfectly comfortable. No one sees them. Write for his true story, "How I Got Deaf and Made Myself Hear." Also booklet on Deafness. Address



Artificial  
Ear Drum

George P. Way, Inc., 612 Holman Building, Detroit, Michigan

Copyrighted material



# Free Vaudeville Show In Handy Printed Form

Bright Red Binding

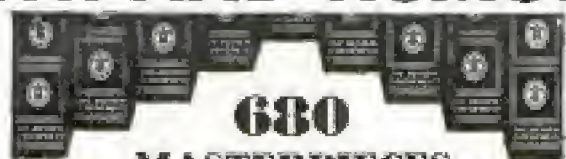
Stamped in Gold



9 Volumes—FREE

251 GREAT AUTHORS

## WIT AND HUMOR



680

MASTERPIECES

OF BRILLIANT MERRYMAKING

## GREAT FUN

Two hundred and fifty-one star authors, 680 entertaining "turns"—here are the pithy and humorous folk tales, the fantastic themes, the light verse, the brightly comic narratives, which have helped to keep the world young since the dawn of literature. Here are the neatly pointed epigrams, the brilliant repartee, the keen satire, the sparkling wit, the profound wisdom, which have helped to make the world wise.

It is without exception the most complete, authoritative, attractive, interesting and useful collection of brilliant and classic literature in existence—the best wit, wisdom and satire in our language.

## FREE TO GOLDEN BOOK SUBSCRIBERS

A special edition, beautifully bound and printed has been made and reserved for new and old friends of the Golden Book Magazine. These are real books bound in handsome red cloth, portrait frontispiece in each, 300 pages, good paper—the kind of books you will be proud to place on your bookshelf. This set is yours absolutely free with a three-year subscription to the magazine at a special reduced price.

### You Will Like GOLDEN BOOK

THE GOLDEN BOOK is the only magazine of its kind. In it you will find the cream of the moderns, as well as the proven masterpieces of the past. Each month you will find the same supreme and thrilling satisfaction in the authors selected: the best in fiction, drama, essay, poetry, philosophy, humor and science. "Golden Book" is now published in the new, handy, pocket-size containing even more entertaining material than the large size. All famous entertainers—the best of all times.

### SENT TO YOU ON APPROVAL

You may have this set in your home for free examination and trial. And, what is more, this may be paid for in small monthly installments. Use this convenient coupon today!

REVIEW OF REVIEWS CORP.  
55 Fifth Ave., New York City

P.M. 12-31

Send me the 9-volume gift set of WIT AND HUMOR and enter my name for a three-year subscription to the Golden Book Magazine. After 10 days, if I like them, I will send you \$1.00 a month for only 8 months. Otherwise, I will return the books at your expense.

NAME.....

ADDRESS.....

(If you prefer, send one payment of \$7.00)

## FREE FOR 5 DAYS!

Franklin Publishing Co., Dept. W-79  
800 N. Clark St., Chicago, Illinois

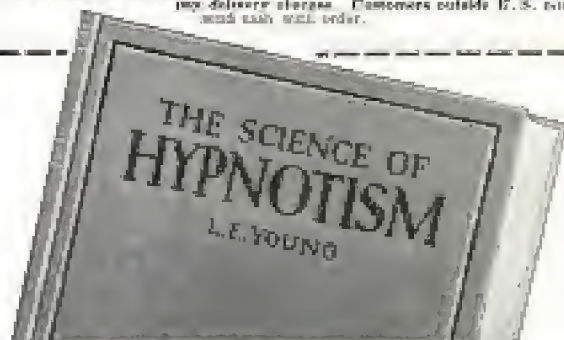
Please send me your amazing book—*The Science of Hypnotism*—by Prof. Young. When the book arrives, I'll pay the postman only \$2.00 plus postage. If I am not satisfied after 5 days' trial, I may return the book and you are to refund my money.

NAME.....

STREET AND NO.....

TOWN.....STATE.....

If you are likely to be out when postman calls, send \$2.00 with coupon and we'll pay delivery charges. Customers outside U.S. must send cash with order.



## I'll Make You a Master of HYPNOTISM ..OR YOU PAY NOTHING

Don't be unpopular, lonesome, or unhappy a minute longer. Now you can make your life what you want it to be—now you can win admiration, success and big money—through the strange power of hypnotism. I'll show you how to use this great force to help you master every situation or **The Five Day Trial is FREE!**

In just a few hours I'll teach you the hidden secrets of Hypnotism—the methods used by the great operators—the amazing things you can accomplish once you understand this mighty power. You can use it to overcome obstacles, achieve your fondest ambitions and become **MASTER** of yourself, friends and acquaintances—either sex. See for yourself how Hypnotism can banish fear, worry and opposition—improve your memory—increase your earnings—and force others to give you the good things in life you deserve!

In this startling book, *The Science Of Hypnotism*, the world famous hypnotist—Prof. L. E. Young—reveals the most carefully guarded secrets of his fascinating subject. He not only explains the methods of noted hypnotists, step by step—but tells clearly all about the nine stages of hypnotism, the Hypnotic Mirror, Mental Telepathy, how to select your subjects, how to make money out of hypnotism!

### SECRETS OF HYPNOTISM

How to Hypnotize at a Glance

Susceptible Subjects

How to Hypnotize by Telephone

How to Give an Entertainment

How to Make Others Obey You

Overcoming Bad Habits

How to Do Dozens of Hypnotic Feats

Use of Hypnotism in Operations

### Try 5 Days FREE—Send No Money

So confident are we that Prof. Young and his great book will quickly teach you the science of hypnotism, that we will send you a copy without one cent in advance! Simply clip and mail the coupon below. When the book arrives pay the postman the special low price of \$2.00 plus few cents postage. Then test the powers of Hypnotism 5 days! If not amazed and delighted return the book and money will be refunded at once. Mail the coupon now.

FRANKLIN PUBLISHING CO.  
Dept. W-79, 800 N. Clark St., Chicago

## MAIL COUPON ABOVE





J. E. Smith, Pres., Nat'l. Radio Institute, the man who has directed the Home Study training of more men for the Radio Industry than any other man in America.

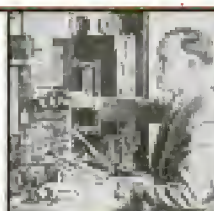
# YOU'RE WANTED for a Big Pay Radio Job

*I'll Train You at Home in Your Spare Time*  
for **RADIO · TELEVISION · TALKING MOVIES**



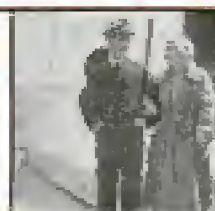
## Set Servicing

Spare timeset servicing is paying N. R. I. men \$200 to \$1000 a year. Full time men are making as much as \$65, \$75 and \$100 a week.



## Broadcasting Stations

Need trained men continually for jobs paying \$200 to \$500 a year.



## Ship Operating

Radio operators on ships see the world free and get good pay plus expenses.

## Aircraft Radio

Aviation is needing more and more trained Radio men. Operators employed through Civil Service Commission earn \$1620 to \$2800 a year.



## Talking Movies

An invention made possible by Radio. Offers many fine jobs to well-trained Radio men, paying \$75 to \$200 a week.



## Television

The coming field of many great opportunities is covered by my course.



**IF YOU** are earning a penny less than \$50 a week, send for my book of information on the opportunities in Radio. It is free. Clip the coupon NOW. Why be satisfied with \$25, \$30 or \$40 a week for longer than the short time it takes to get ready for Radio?

## Radio's growth opening hundreds of \$50, \$75, \$100 a week jobs every year

In about ten years Radio has grown from a \$2,000,000 to a \$1,000,000,000 industry. Over 800,000 jobs have been created. Hundreds more are being opened every year by its continued growth. Men and young men with the right training—the kind of training I give you—are stepping into Radio at two and three times their former salaries. J. A. Vaughn, 3107 S. Grand Boulevard, St. Louis, Mo., writes: "Before I entered Radio I was making \$35 a week. Last week I earned \$110 selling and servicing sets. I owe my success to N. R. I."

## You have many jobs to choose from

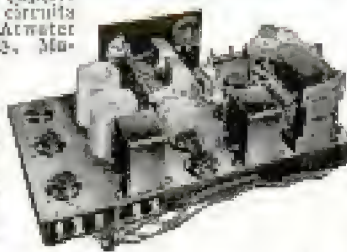
Broadcasting stations use engineers, operators, station managers and pay \$1,200 to \$5,000 a year. Manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers, for jobs paying up to \$7,500 a year. Shipping companies use hundreds of Radio operators, give them world-wide travel with board and lodging free and a good salary besides. Dealers and jobbers employ service men, salesmen, buyers, managers, and pay \$20 to \$100 a week. There are many other opportunities too.

## So many opportunities many N. R. I. men make \$200 to \$1000 while learning

The day you enroll with me I'll show you how to do 28 jobs, common in most every neighborhood.

## I Give You a Outfits of Radio Parts for Practical Home Experiments

You can build over 100 circuits with these outfits. You build and experiment with the circuits used in Crosley, Atwater Kent, Eveready, Majestic, Zenith and other popular sets. You learn how these sets work, why they work, how to make them work. This makes learning at home easy, fascinating, practical.



for spare time money. Throughout your course I send you information on servicing popular makes of sets; I give you the plans and ideas that are making \$200 to \$1,000 for hundreds of N. R. I. students in their spare time while studying. My course is famous as the one that pays for itself. G. W. Puse, 1231 Pine St., McKenzie, Tenn., writes: "I picked up \$955 in my spare time while taking your course."

## Talking Movies, Television and Aircraft Radio are also included

Special training in Talking Movies, Television and home Television experiments. Radio's use in Aviation, Servicing and Merchandising Sets, Broadcasting, Commercial and Ship Operating are included. I am so sure that I can train you satisfactorily that I will agree in writing to refund every penny of your tuition if you are not satisfied with my Lessons and Instruction service upon completing.

## 64-page book of information Free

Get your copy today. It tells you where Radio's good jobs are, what they pay, tells you about my course, what others who have taken it are doing and making. Find out what Radio offers you, without the slightest obligation. ACT NOW!

J. E. SMITH, President  
National Radio Institute  
Dept. 1 NQ  
Washington, D. C.



THIS COUPON IS GOOD for  
One **FREE** COPY OF  
MY BOOK

mail it  
Now

J. E. SMITH, President  
National Radio Institute, Dept. 1 NQ  
Washington, D. C.

Dear Mr. Smith: Send me your free 64-page book "Rich Rewards in Radio." I understand this does not obligate me and that no salesman will call.

Name.....

Address.....

City..... State.....

When writing to advertisers please mention Popular Mechanics

Copyrighted material



# Another ~~SPEEDO~~ Profit Sensation! The Revolutionary New SUPER-JUICER!



Hangs On  
The Wall!



JUST TURN  
THE CRANK

## Oranges..Lemons..Small Grapefruit Juice Themselves Instantly!

### NOW FOUR PROFITS ON ONE SALE!..

MAKE  
UP TO \$12 IN AN HOUR

Little wonder Speedo people laugh at hard times! Four revolutionary inventions that bring up to 4 quick sales and profits on every order! And what a market! Over 20 million homes without even one Speedo... and others already enjoying one or two and waiting to buy the others! For profit's sake, write at once for unique new 4-PROFIT PLAN that guarantees your sales without risk to you! But hurry—territory going fast!



**Million Dollar Can Opener**  
Slips on walls—holds can for you. A series of the wire runs OUT top of any can—clean, smooth, slick, like magic. No jagged edges, no cuts. Food goes easily.



**Magic Groove Sharpener**  
Works like magic. Knives, tools, screws sharpen themselves. Holds on wall. Easy to use. Indispensable to housewives, sells on sight.



**Automatic Jar Opener**  
Opens jars, bottles, glass containers like magic. Holds down jar. Just turn crank. No work, no broken bottles, no waste, no mess.

### Without Work, Waste or Worry!

**A** MERICAN genius has triumphed again—with a remarkable new fruit juicer that banishes old-fashioned makeshifts—and lines agents' pockets with easy dollars!

Everybody's drinking orange, grapefruit and other juices for health at least once a day. But up to now, housewives lacked a simple, practical, inexpensive juicer that could quickly and easily reap out all of the juice from fruit without waste, fuss, mess and bother—that would automatically strain all the seeds, pulp and pith and that would be easy to clean.

Now this miracle has come! Imagine a device that hangs on the wall and juices fruit with just the

turn of a crank! Even a child can operate it. New type reamer quickly gets all the juice. Specially-designed perforated strainer strains seeds, pulp and pith. No spilling, no fuss. And so easy to clean! Just turn crank and rinse—that's all! Can't rust. Guaranteed 5 years. Yet priced amazingly low. No wonder agents report up to \$8 and \$12 an hour! Rush coupon at once for full details of this and three other Speedo inventions needed and wanted in 20,000,000 homes! Write quick! Central States Mfg. Co., Dept. W-5135, 4500 Mary Ave., St. Louis, Mo.

### FREE TEST OFFER... Mail Coupon Now!

CENTRAL STATES MFG. CO., DEPT. W-5135  
4500 Mary Ave., St. Louis, Mo.

Please rush full details about your amazing new SUPER-JUICER and three FREE TEST OFFER. Also tell me about UNIQUE 4-PROFIT PLAN that guarantees sales without risk.

Name.....

Address.....

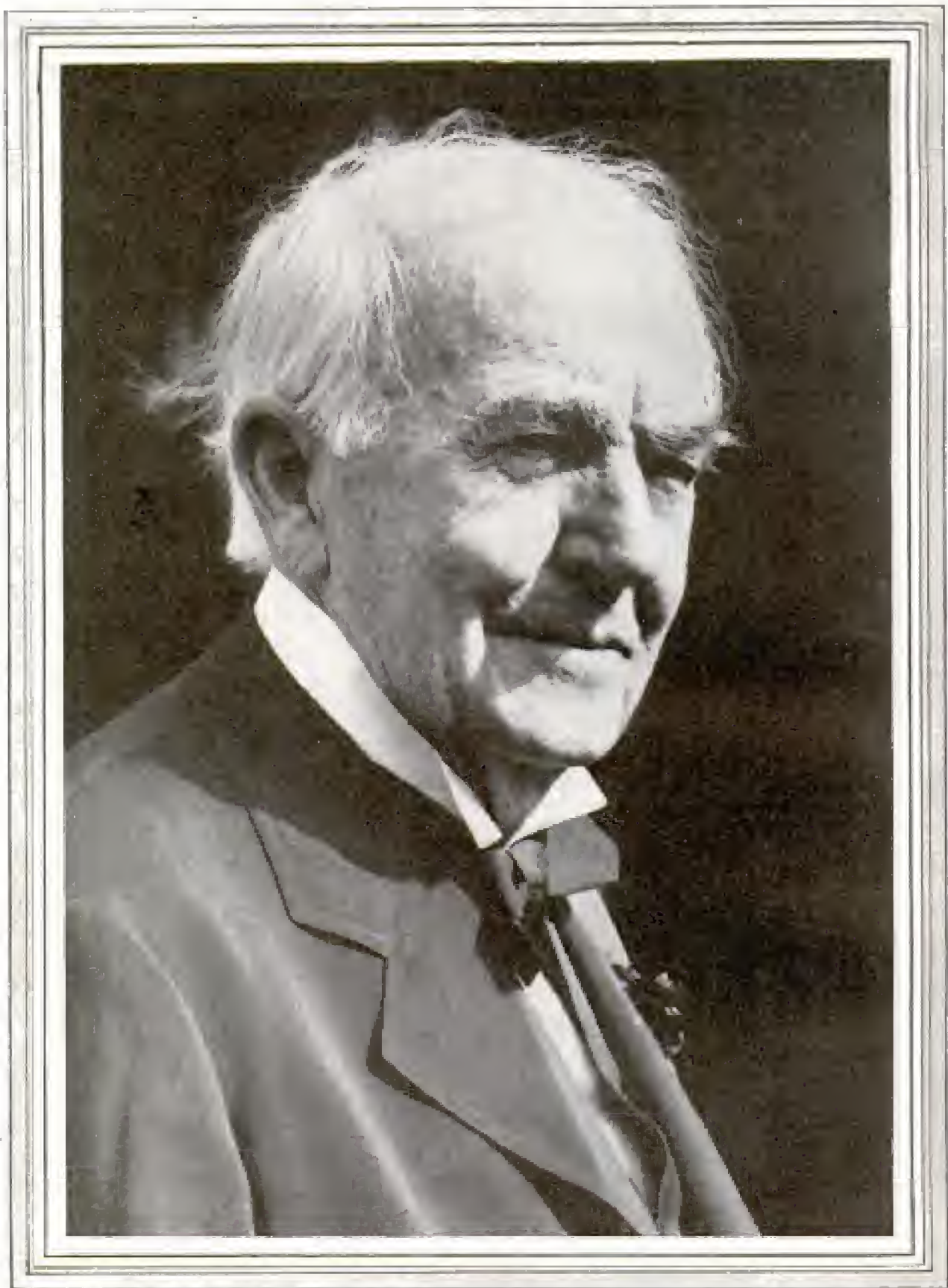
City..... State.....

( ) Check here if interested only in one for your home.

When writing to advertisers please mention Popular Mechanics

Copyrighted material





**A** RECENT photograph of Thomas A. Edison, whose memory is honored throughout the world for his services to mankind and his contributions to human progress.



# Popular Mechanics Magazine

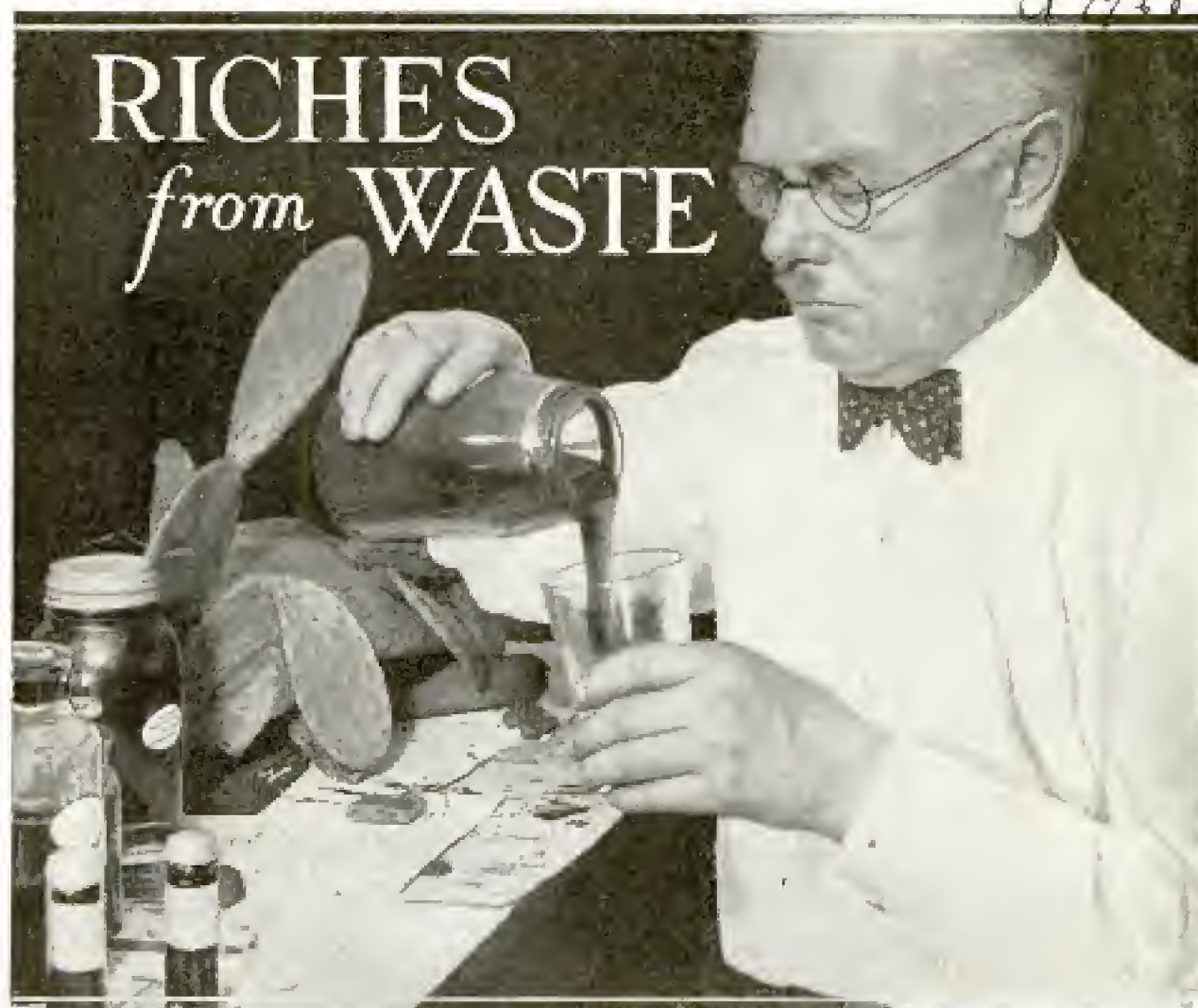
REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 56

DECEMBER, 1931

No. 6



1968

Mr John C. Wickham  
cannot locate

The Gummy Juices of the Cactus Plant Have Been Turned into Rubber by the Los Angeles Experimenter Shown Above; the Liquid Is Cactus Sap after Cooking

THERE are many valuable things made today from material that once was thrown away as waste. Go first to the copper refineries and see what change science has made in this field. A few years ago, all copper smelters released great quantities of sulphur dioxide. This killed all the grass for miles around the plant, making for trouble with the cattle men of the west. Finally, the refineries installed equipment to use the gas to make sulphuric acid.

In time sulphuric acid became so plentiful that the price dropped and its manufacture became unprofitable. So the

chemical engineers had to find a new and better use for the sulphur dioxide. They hit upon a plan to ship in phosphate rock and with the sulphuric acid made acid phosphates, which are essential in agricultural fertilizers. By this process, the same fumes which had formerly destroyed crops were employed to make them grow more abundantly.

About a hundred years ago, people in Pennsylvania, Ohio, Kentucky, Tennessee and West Virginia used to dig brine wells from which they made salt. Much annoyance was caused by the appearance of oil in some of these wells.

see mag. 1930. 75-5  
Jan 1939 69

Cont. Harry K. Hobart, 71, Albemarle Ave  
Hempstead, L.I. New York

Copyrighted material



91968  
882



coins like the present-day nickel, and people who were fooled into buying a gold brick often found that under the thin coating of gold they had a solid brick of "worthless" platinum.

Then it was discovered that platinum would resist corrosion by many substances which attack other metals, and so is suitable as a container for corrosives. Since then it has steadily risen in value until now it is far more precious than gold.

Chemists working on a process to make sulphuric acid from the gas that troubled the copper refiners, knew that the first step was to add oxygen from the air, but the sulphur dioxide and the oxygen from the air refused to unite. Finally a chemist tried bringing the two substances together in contact with a platinum screen, and the combination took

In those days, people had plenty of use for salt, but there was little use for oil. It was used in a small way in medicines and was a not very satisfactory illuminant. Today salt water and oil still occur together, but it is the oil wells that are spoiled by the salt water,

Early refiners met another annoying problem. In making kerosene, they extracted a rather explosive substance for which there was practically no market. They even had trouble in throwing it away. They poured it on the ground and frequently into rivers. Many fires of sudden and unknown origin were caused by this. Laws were passed forbidding dumping of the liquid, and the refiners were at their wits end to get rid of it. Today it is this fluid for which refineries are mainly operated. It is gasoline!

Just as dramatic as the stories of copper fumes and gasoline is that of platinum. At one time it was so cheap that the Russian government used it for small



First Step in Turning Corn cobs into Furfural, Above, and Seaweed for Making Bread

place immediately. In like manner platinum screens force ammonia to take oxygen out of the air in making nitric acid.



Q1971

In these chemical processes the platinum itself is not altered.

The creamery is the field of another big chemical triumph. The old nursery lines can be truthfully paraphrased: "Where are you going, my pretty maid?"

"I'm going to milk the cow, sir, not only of milk, but of unbreakable cups and saucers to serve it in, eyeglass rims, beads, fountain pens, massage cream, glue and waterproofing paints."

This may seem like a fairytale, but all these articles are made from milk, and not the milk we drink either, but from the skim milk that dairies used to throw away.

### ELECTRIC STOVE FOR WIENERS COOKS AUTOMATICALLY

Operated as simply as a toaster, an electric frankfurter cooker is being offered to simplify the making of this form of sandwiches. The cooker can be operated on the kitchen or dining-room table from any wall socket. It consists of a colored base on which is a tray with individual compartments for the sausages. Water is placed in each compartment and becomes part of the electric circuit when the current is turned on.



Electric Frankfurter Cooker with Individual Compartments in Which Water Is Boiled



Examples of Book Ends and Table Lamps Made by Mounting Small Animals on Wooden Bases

### SMALL ANIMALS ARE MOUNTED TO MAKE BOOK ENDS

Persons who have taken up taxidermy as a hobby recently have been devoting their skill to the making of useful and artistic home decorations by mounting the commonest of small birds and animals, such as squirrels, rabbits, frogs and pigeons. Squirrels, for instance, are being mounted on the natural bark from trees to form attractive book ends, and these and other small animals come from the taxidermist as the bases for electric lights or ash trays. Other mountings are made to form gun racks, tie racks and thermometer holders.

### GLACIERS TELL THE WEATHER

That glaciers foretell the weather as well as regulate drouth and flood, was the recent statement of a Norwegian scientist. He cited the result of great advances in Norwegian glaciers between 1720 and 1740, which period terminated with three years of famine because the summers were cold and wet so that the cereals did not ripen.

W. Wernerskiold  
in paper before British  
Asn. Advancement of Science

J. W. Woodward, Omaha, Neb.

A 2049

N.Y. James  
10/16/01

Isodgear Mfg Co  
2615 W. 4th St.  
Kansas City, Mo

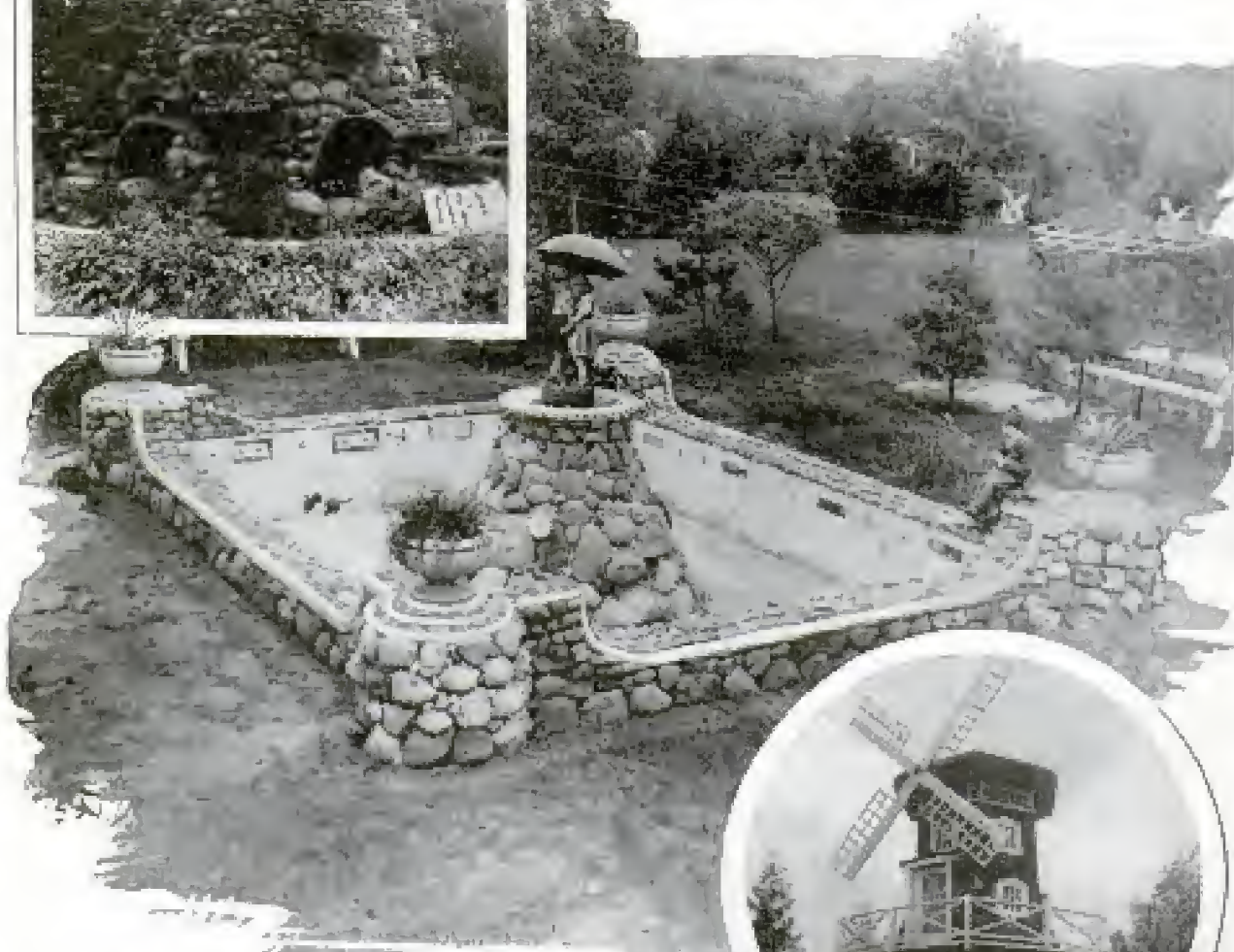
Copyrighted material



# Miniature Castle Built in Huge Rock Garden



cial jewels and has more than 100 windows. Winding steps lead to the top where an observatory is located. Another "set" is a windmill modeled after an exhibit at the Chicago World's Fair in 1893. The third prime attraction is his replica of the "Lovers' Fountain." It is



Famous "Lovers' Fountain" Reproduced in a Rock Garden; Miniature Castle Is Seen Above, and, at the Right, a Windmill That Really Runs



Fifteen years ago, a retired industrialist of Fox River Grove, Ill., purchased four acres of wooded land. Working in secret since that time, he has constructed a gigantic rock garden, including three magnificent replicas of attractions in other lands. One of these is a miniature castle, modeled to scale after one built abroad between 500 and 600 years ago. The miniature is entirely hand-carved, has a tile roof and is decorated with hanging baskets of flowers cut in the rock. It has four floors, each with different-colored art-glass lights. It is studded with arti-

seventy-five feet long and thirty wide with two human figures in the center.

## ALUMINUM-WIRE BRUSHES

Brushes which are claimed to stand long service in the application of acids have been placed on the market. Made of aluminum wire, these swabs will resist, for a long time, the effects of acids used by sheet-metal workers.

Cleveland Acid Swab Co.  
2003 Marlow Ave.  
Cleveland Ohio

John Legash Dr.

Q 1908

open to public

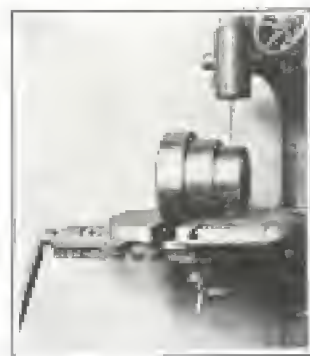


Developed by U. S.  
Bureau of Standard A 1952  
POPULAR MECHANICS  
Washington, D. C.  
EYE-AND-EAR SIGNAL FOR PILOT  
TO MAKE FLYING SAFER

Combining eye and ear signals for pilots, a radio transmitter now being tested is expected to make flying safer. The transmitter sends impulses which vibrate two small reeds in an indicator installed in the plane. When the plane is on the course, the reeds vibrate at the same rate and show two narrow white bands. Off the course, the reeds vibrate unequally, the rate increasing on the side to which the plane is veering and creating a wider white band there, while the width of the band on the other side decreases. At the same time, another transmitter, operated on the same frequency, may send directions, weather reports or other information by voice. The plane's one receiver catches both signals, but a small filter separates the voice from the reed impulses and sends the voice to the pilot's headphones.

DRILL TABLE AND VISE IN ONE  
FOR ODD-SHAPED WORK

To enable the operator to make secure set-ups quickly, a combination drill table and vise is being offered to replace the customary table on a drill press. It is actually a split table, with vise jaws faced with steel, and eliminates the use of clamps, angle irons, parallels, V-blocks and other equipment to prepare odd-



shaped work for drilling. The jaws hold the work securely and rigidly, preventing much drill breakage and eliminating scrap and waste caused by imperfect work. For regular drill presses, the shank is accurately turned to size, but for electric and speed drills and radials, special mounting arms are available. Four different sizes are obtainable.

Names and addresses of manufacturers of articles described in this magazine will be promptly furnished, free, by our Bureau of Information.

at Radio. Electrical  
World's Fair  
385  
Madsen Square Garden  
N.Y.



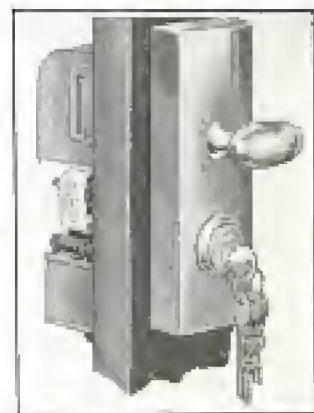
Small Piano Which Also Contains a Radio; Either Instrument Can Be Played Independently

RADIO AND PIANO COMBINED  
IN ONE CABINET

One of the latest musical instruments is a small piano which contains a radio with a control panel beside the music rack. With this combination, the musician finds it an easy matter to turn on the radio receiver and play some accompaniment to the program on the piano, although either instrument can be used independently.

LOCK TELLS TIME OF OPENING  
AND KEY THAT DID IT

A recording lock that not only tells the time it was opened but the key that did it, has been placed on the market. It can be used in connection with any standard make of door fitting. It prints on a tiny paper roll, like that in a cash register, what time the door was locked and each time it was opened. It has facilities for as many as six keys, each making its own forgery-proof imprint on the roll.



Mohawk Corp.  
North Tonawanda, N.Y.  
All America  
North Tonawanda, N.Y.

Modern Machine  
Tool Co., 601 S. Water St.  
Jackson, Mich.

The Recording  
Locks Co., 53 E.  
Spring St. Columbus, Ohio



Q 1932  
886

Contr. Elmer Blasseman, 55 W. 86th  
new York  
POPULAR MECHANICS

## Microphone Like Bomb Makes Better Talkies



"Shooting" Scene with Bomb "Mike"; Two Types of Microphone Contrasted at Left



Microphones that are round and black and look like bombs have been adopted at a California talkie studio, after many experiments. Engineers heretofore have concentrated largely on sound pick-up in the microphone rather than on the housing of the instrument, and it was found

that no matter how perfect the interior mechanism, a certain amount of distortion crept in. The "gas pipe" type worked perfectly only when the sound came directly into it from the front. Working back to an old principle of physics that a spherical body obstructs the passage of a sound wave less than any other form, engineers found that a spherical microphone housing gave better results from a distortion standpoint than any previously tested. The new instrument, it is said, can transmit almost every sound wave audible to the human ear. The new "mike" weighs less and has one-third fewer working parts than formerly used.

### RUINS SHOW STONE-AGE RACE LIVED IN PHILISTINE CITY

Excavations on the site of Gaza, the Philistine stronghold whose gates were carried away by Samson, recently uncovered evidence of human occupation

Hollywood, Motion  
Picture Equipment Co. Ltd.  
6416 Selma Ave Los Angeles Calif

Science Service 9/29/31  
Copyrighted material



running back to the latter half of the stone age. The latest period of occupation was that of the Hyksos, wild horsemen who buried their horses with their warriors. Horse skeletons were found alongside human remains. Beneath the Hyksos stratum, evidences of the older Canaanite culture were discovered. This race had city planning, public baths and well built religious shrines. Earlier still were signs of another invasion from the north, that had destroyed the titanic fortifications of the copper-age civilization, which fades back into the later stone age.

### ADJUSTABLE GOLF-CLUB GRIPS TO CURE TROUBLES a 1936

Adjustable thumb grips for your golf clubs promise a cure for many ills of the game. They can be "whipped" on the shaft at the correct points to prevent hooking, slicing and slipping in rainy weather. The individual grips are made of aluminum and two of them provide the correct position for both thumbs. The fingers of each hand then fall naturally into position. The grips are especially useful in golf schools.



Golf-Club Grips That Can Be Fitted to Any Hand and Correct the Gelfer's Control

where the correct grip is one of the most difficult points to teach.

Fully 300,000 motion-picture projecting machines of the sixteen-millimeter class are in use in the United States.

H. O. Butler,  
400 W. Madison  
Chicago



Crashes of Student Planes Are Eliminated by Suspending the Training Ship from a 1,000-Foot Cable

### PLANE FLIES ON TROLLEY WIRE TO TRAIN STUDENTS

Safety under real flying conditions has been attained by suspending a training plane from a 1,000-foot cable, strung between masts at a height of fifty feet. The plane, equipped with a four-cylinder motor, thus can fly 1,000 feet with the student protected at all times from crashing.

### "TIRED" GLASS IS REJUVENATED BY HEAT TREATMENT a 2030

When special glass used to pass ultra-violet rays becomes opaque or too "tired" to let these health rays through, heat treatment will pep it up. Tests at the bureau of standards show that if the glass is subjected to five hundred degrees Centigrade for a few hours, it will be rejuvenated to ultraviolet transparency. Chemical changes involving oxidation of the iron content in the glass are usually held responsible for its gradually becoming opaque to the health rays. It seems that the glass absorbs light when in use. Under the heat treatment, the glass gives off its pent-up light in a glow which lasts until the discoloration has disappeared and it is ready to serve again.

A. Q. Tool and R. Starr,  
Washington, D. C.

Developed by Pacific Air Service, New York City.  
351 W. 42nd St., New York City.

Detector

Same Service



a 1953

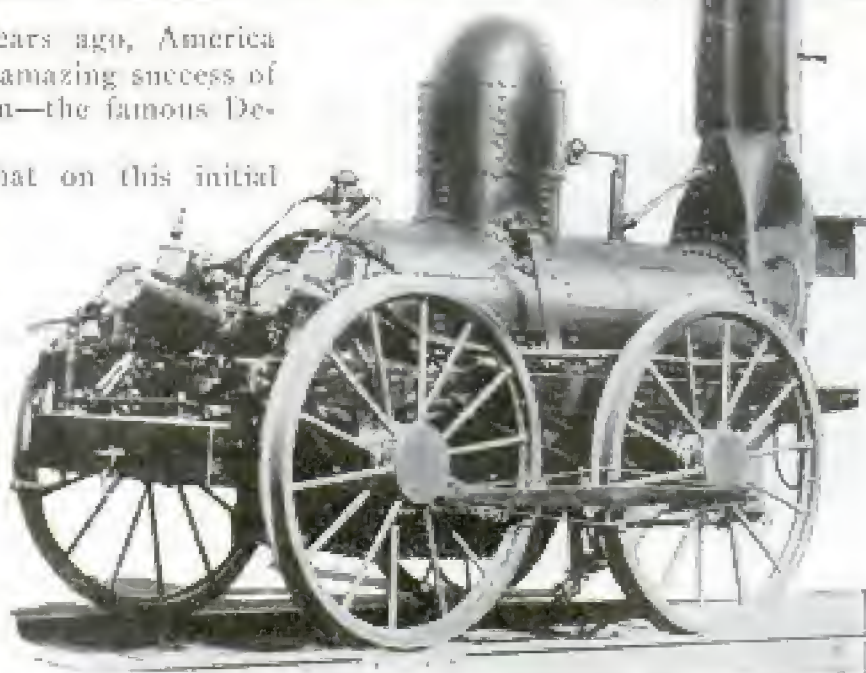
# MASTER MODEL



**J**UST a hundred years ago, America was agog with the amazing success of its first passenger train—the famous DeWitt Clinton.

Tradition relates that on this initial trip of the Mohawk and Hudson railroad, the original unit of the New York Central lines, the passengers' clothes caught fire from the "chimney" of the locomotive, and that the cars jolted so much fence rails were placed between them as bumpers.

A replica of the old train, with many of the original parts, is now to be seen in the Grand Central station in New York City, and beside it is



"Centuries" Passing Each Other at Buffalo, and, Below, the Old DeWitt Clinton Engine in Replica at Grand Central Station

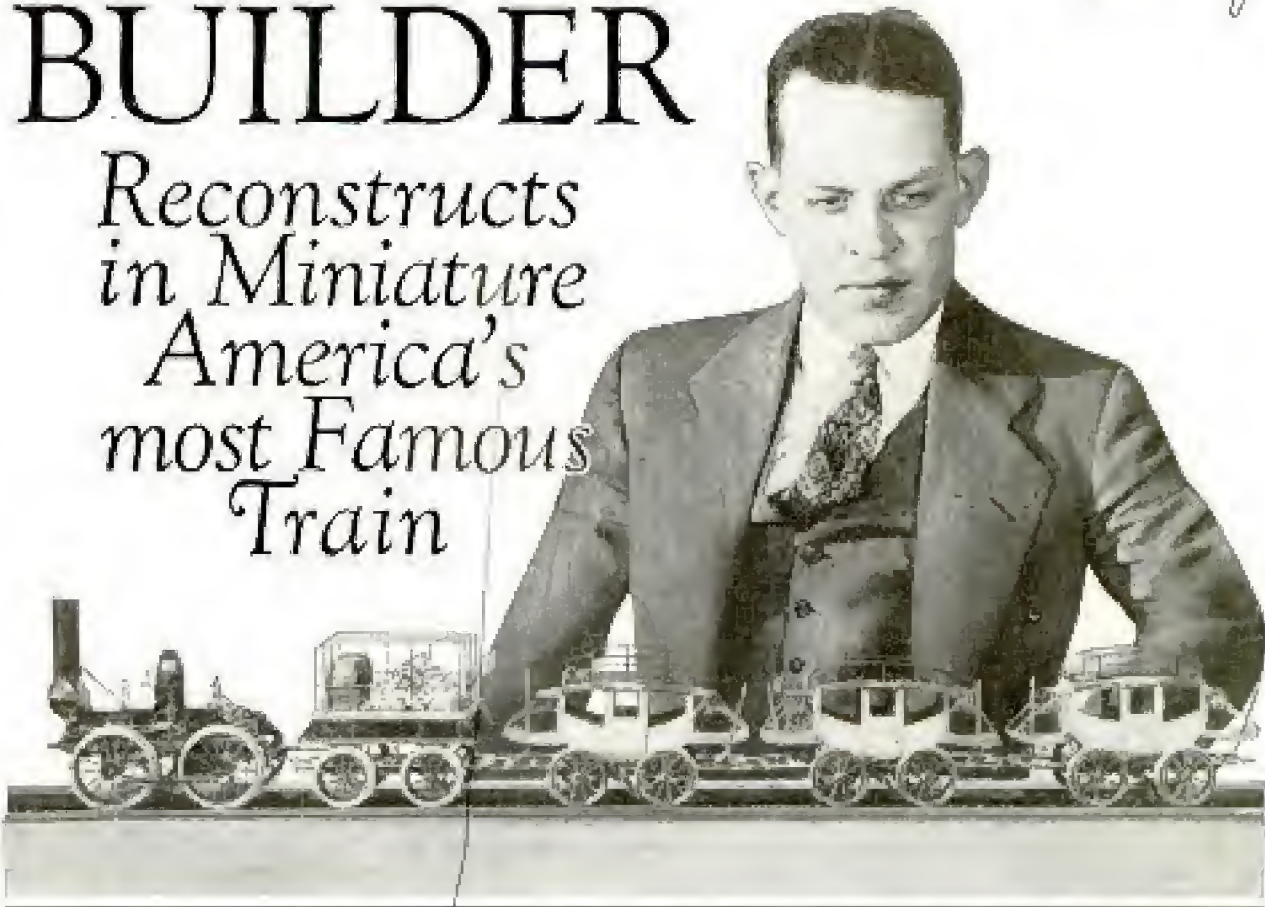
an exact scale model—the delight and wonder of every craftsman who views it.



*R. H. Claudius, 919, 88 St. N.  
Brooklyn, N.Y.*

# BUILDER

Reconstructs  
in Miniature  
America's  
most Famous  
Train



Reginald H. Claudius with His Model of the DeWitt Clinton Train, Built to Exact Scale and Exhibited by the New York Central Side by Side with the Full-Size Replica

This is the work of R. H. Claudius, who began model making as a pastime, but who, through it, has achieved both fame and advancement in his profession.

During the war, Mr. Claudius served on a torpedo-boat destroyer. Afterward he went to the New York Central lines as a fireman's helper in the electric-locomotive service. "My duties consisted in getting the engines ready for the road, seeing that fuses, switches, third-rail shoes, controller and lights were ready for service," he says. "Then the idea struck me to start building a model of one of the locomotives on which I worked. I wanted to see just what a locomotive would look like if it had had a good bath and shrunk up to the size of a toy.

"My workshop was the kitchen, my workbench was the washtubs, my tools consisted of a few twist drills and hand-drill stock, some small files, both coarse and fine, a hacksaw, a jewelers' saw, gas pliers, cutting pliers, small bench vise and tin snips. In addition to the above, small machine screws were purchased and necessary material was stocked."

"After ten months' work, the locomotive was finished, packed carefully in a box and sent to the master mechanic, who became interested not only in the model, but in the way it was built, and that none of the time consumed in constructing it had interfered with my regular work. The model was then sent to the electrical engineer and was placed on exhibition. I was then transferred to the electrical engineering department.

"Shortly after, I was assigned to build an exact replica of the famous Twentieth Century Limited, including the new Hudson-type locomotive and tender, three standard Pullman sleepers, club car and one observation lounge car.

"I felt heir to this job on account of past performances, and started immediately to improve my shop, having moved from an apartment to a private house with a good-sized cellar which was readily converted into a workshop. The machines installed were:

"One electric drillpress (bench size), one foot punch press, one sheet-metal hand shear, one small lathe, with scroll





Thomas Melghan, Movie Actor, at the Throttle of the DeWitt Clinton Replica during the Centennial Pageant

chuck and milling attachment, and one grinding and buffing machine. In addition, Swiss files, keyhole files, tin shears, ball-peen hammers, center punches, etc., were purchased. The shop having been completed and stocked, a fifteen-month job was started on the 'Century.' The punch press was used in cutting out windows and in pressing in the rivet impressions. In the entire six cars there are approximately 23,935 rivet impressions.

"After completion of the Century, a model of the DeWitt Clinton train was

second only to that of Stephenson's "Rocket."

The weight of the DeWitt Clinton was 6,758 pounds. It had two cylinders, one in each side of the engine at the rear end of the boiler, of five and one-half-inch diameter and sixteen-inch stroke. It was rated at about ten horsepower.

Experiments with this locomotive developed some troubles. The steam-supply pipe lead-

constructed on the same scale of one-half inch to the foot. Exact details of how to build this DeWitt Clinton engine, tender and three stage-coaches will be given in following issues of Popular Mechanics Magazine.

"Model building is one of the most fascinating and profitable pastimes, I know. Its principal requirement is patience."

While the DeWitt Clinton was not the first locomotive to turn a wheel in America, that honor belonging to the Strombridge Lion, it exercised a greater influence in the development of the railway than any other of the pioneer locomotives, and its niche in the Hall of Fame is

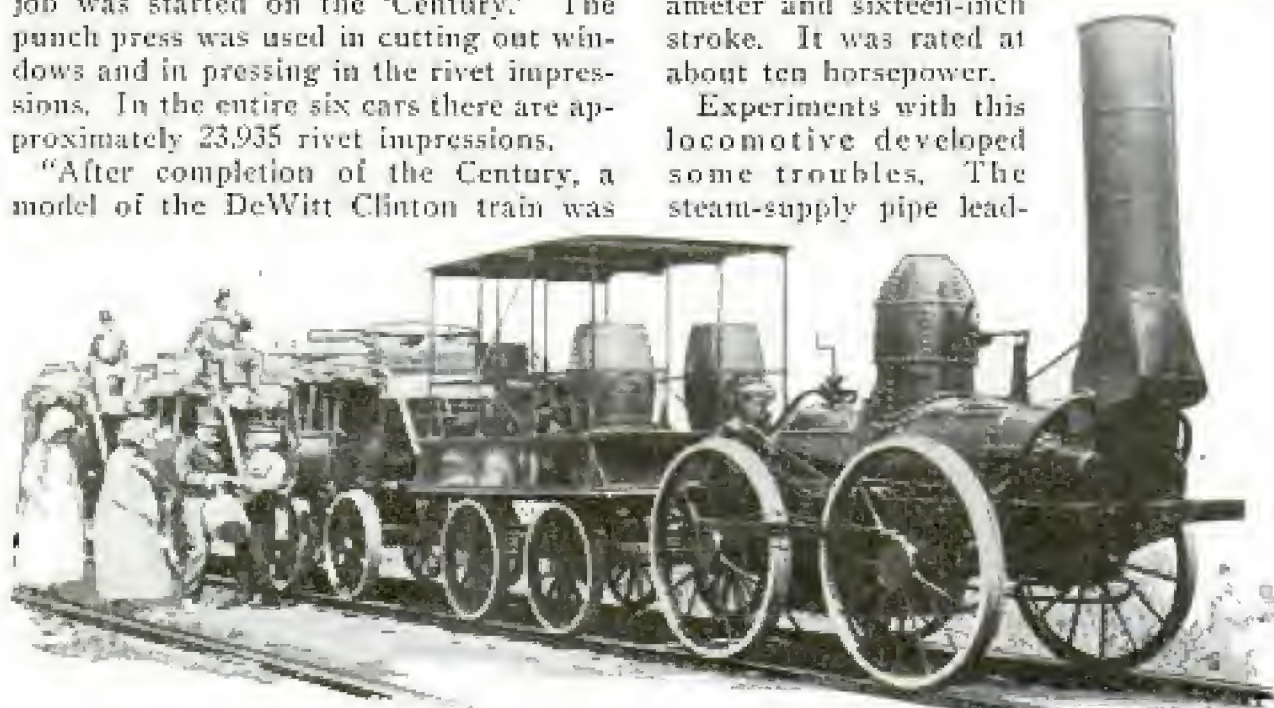


Photo of the DeWitt Clinton Train Taken during the Pageant Which Celebrated the One-Hundredth Anniversary of the Chartering of the Mohawk and Hudson Railroad



ing to the cylinders probably terminated in the upper part of the boiler, for the surging of water in the boiler was so great it passed over into the cylinders.

The draft was bad, and the chimney, as the smokestack was then called, was too large. An effort was made to use anthracite, but it was found to pack and required a blast. An artificial blast was given and then the heat seemed too great in one place and too scant in others and melted the grates. Resort was then had to wood, and that was the fuel used on the first trip.

What it did not have in the way of the very simplest appliances which were soon found to be indispensable on locomotives, is somewhat remarkable. There was no headlight, no bell, no whistle, no spark arrester in the stack, no cab. The engi-

neer stood on a small platform at the rear of the boiler without protection from the sun or weather, nor was there any covering or protection for any of the levers or machinery. The fuel had to be passed by the fireman into the furnace over this small platform on which the engineer stood, having no seat so far as can be learned, and how the two could do their work in the narrow space is something of a mystery.

It is said its average speed, drawing three loaded cars of about eight tons' weight, was fifteen miles an hour, but that it frequently did thirty miles an hour with the same load. It was used only between Western avenue in Albany and the head of the inclined plane at Schenectady, a distance of about seventeen miles.

## Build This Model and Win a Prize

**I**N following issues of this magazine you will find a series of articles by R. H. Claudius telling exactly how to build a scale model of the famous DeWitt Clinton train. To encourage model builders, Popular Mechanics will offer the following prizes:

*First Prize*, \$1,000 in cash, and a week's visit to New York via the New York Central's Twentieth Century Limited.

*Second Prize*, \$500 in cash, and a week's visit to New York.

*Third Prize*, \$250 in cash, and a week's visit to New York.

In addition, there will be five prizes of \$50 each, and ten of \$25 each for the next best models. In the event of a tie for any prize offered, a prize identical in all respects with that tied for will be awarded to each tying contestant.

The contest is open to all residents of the United States and Canada, and, instead of the trip to New York, a similar trip to Chicago may be substituted at the option of the first three winners should they reside in the east.

The judges of the contest will be Mr. Claudius, H. H. Windsor, Jr., editor and publisher, and officials of the New York Central Railroad. The date for closing the contest will be announced in the final article.

All contestants will be required to submit photographs of their models, and, in case of necessity, the model itself may be requested for inspection by the judges. All models will be returned.

In the latter case, shipping charges will be paid by Popular Mechanics Magazine.

Watch for the Next Issue of Popular Mechanics



# Ocean Liners Fitted with Smoke Deflectors



Smoke and gases, always annoying to passengers on ocean liners and coast-wise vessels, are being diverted from the passenger decks and thrown high into the air by deflectors. The discomfort caused by coal and oil smoke and gases falling almost directly on-

to passenger decks has long been a problem for trans-atlantic ship lines. Several methods of diverting the smoke have been tried, but none seems to have been as successful as that used on the liner "Bremen," which is operated between New York and German ports. At first the "Bremen" had short smokestacks, apparently cut off to permit the liner to pass under bridges. These short funnels caused the smoke to pour down on passengers, resulting in constant complaints. The steamship company elevated the "Bremen's" stacks and then pierced each of them near the rim. Baffleplates then were installed behind the slits in each stack, so that smoke and gases were thrown high into the air, rather than down on passenger decks, as the liner steamed against high winds at sea, and this method of smoke elimination is being tested by other ship lines. Another big ocean liner, soon to be placed in serv-

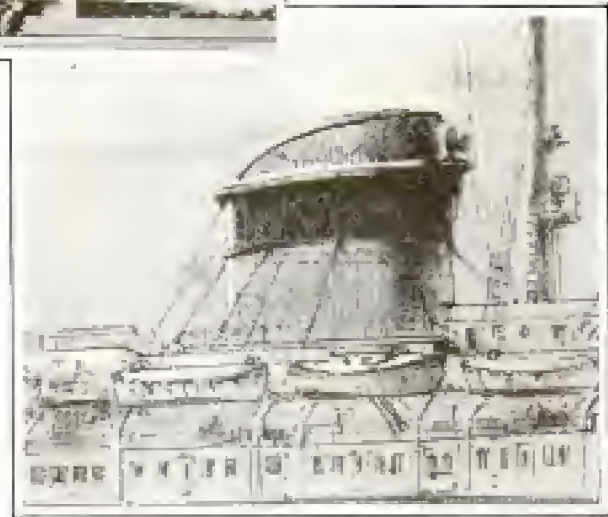


Courtesy: Norddeutscher Lloyd  
Top, the "Bremen" before its stacks were elevated; Center, the liner's raised funnels, pierced for baffleplates; Right, French ship "Champlain"

ice between Havre, France, and New York, via Plymouth, England, is equipped with similar devices. This ship, the "Champlain," has a short funnel with deflectors built in near the rim.

## NEW FORM OF LIVER EXTRACT CURES SECONDARY ANEMIA

Secondary anemia, a common human affliction, has been cured in dogs by use of a new form of liver extract. This form of anemia is usually accompanied by great physical or mental lassitude. The extract developed in the tests on dogs is palatable, unlike other forms which usually cause the stomach to rebel at tak-



ing the large quantities of liver necessary. Secondary anemia is more common, and the patient's recovery is slower than in pernicious anemia.

Chicago, Ill. 10/5/21

## THIRTY-DEGREE V-TYPE MOTOR HAS LESS VIBRATION

Cylinders set at a thirty-degree angle and firing in staggered order produce less vibration in a motor developed especially for use on fire-truck equipment. The

Bremen, Germany

Developed by Dr. H. Whipple, Head of Washington School of Hygiene & Tropical Medicine



Chicago - 383 S. Michigan

American La France  
and Foamite Corp  
903 Erie St, Amherst, N.Y.

A 1903

POPULAR MECHANICS

893

McCormick & Co. Chicago

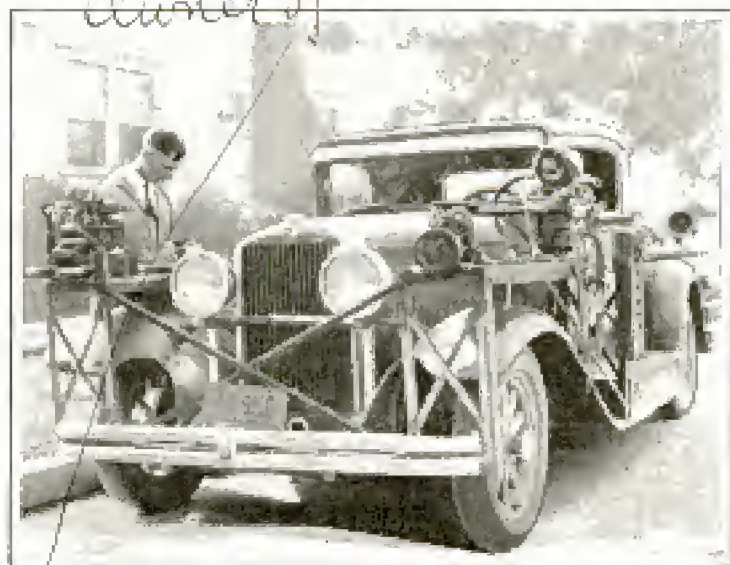
motor has twelve cylinders, with the theoretical smoothness of twenty-four. It was built for double duty, as a propulsion unit and also for driving fire pumps. Horsepower at 2,800 revolutions per minute is 245, giving a speed of sixty miles an hour. For pumping purposes, the engine will deliver 1,500 gallons a minute through attached hose.

A 1980

### MACHINE SHOP ON AUTO PAYS COST OF TOURING

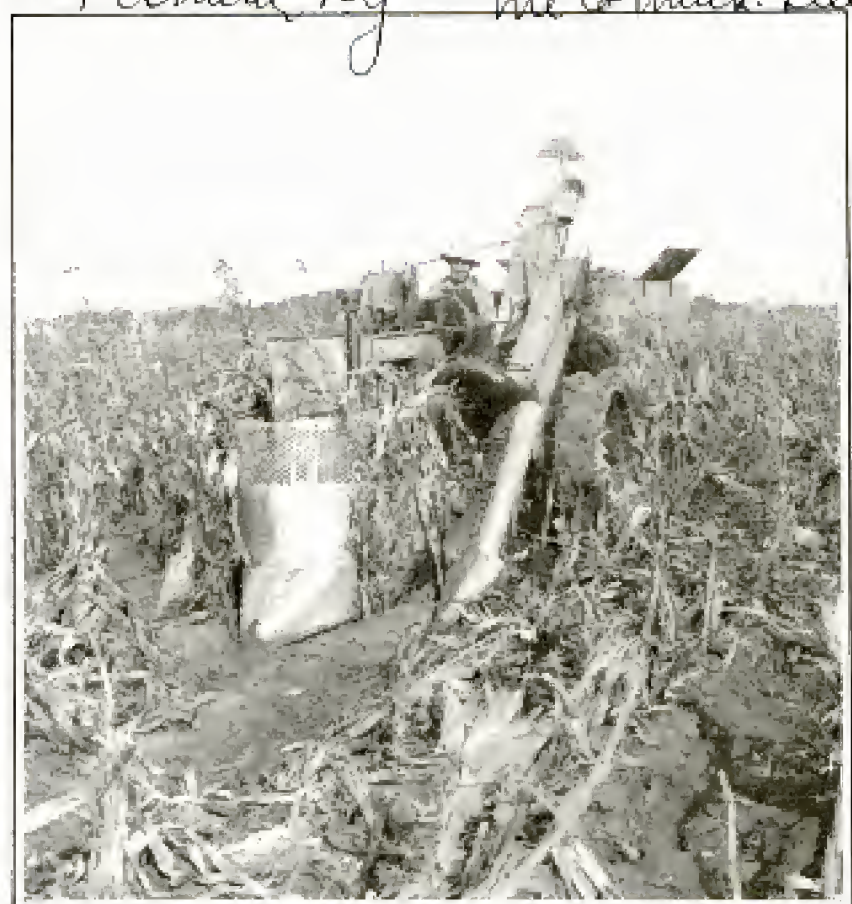
Installation of a number of machines on his automobile enables a Denver man to combine pleasures of touring with the necessity of going after business. He closed a completely equipped saw-filing and tool-grinding shop, mounted a few of the smaller machines on his coupe and began an extensive tour. A fair profit was earned over and above all touring expense. Four electric motors and a number of other tools were mounted on sturdily constructed platforms, the framework for which was fastened to the car.

Owner of



Complete Grinding and Sharpening Shop Fitted on an Auto That Pays Its Owner's Touring Expenses

Keen Edge Shop  
2357 S. Cherokee, Denver, Colo.



Corn Picker and Husker That Harvests Any Two Rows in the Field at One Time; Two Men Do the Work of Sixteen

### PICKER AND HUSKER FOR CORN DOES WORK OF SIXTEEN

Two men with the aid of a new corn-picking and husking machine, can harvest sixteen to eighteen acres of corn in a ten-hour day, the work of sixteen men of average skill. The harvester picks and husks two rows at a time and can enter the field at any point and travel down the rows without disturbing adjacent ones. One man operates both picker and tractor, while the other handles the unloading of the wagon.

### STEAM ROLLER RIPS UP PAVED ROADS A 2043

Iron claws have been fitted to a steam roller for ripping up asphalt roads which need to be repaired. The claws dig one to five inches deep, tearing up the hard paving material as it goes, and saving the cost of a large crew of laborers.

maker  
Copyrighted material

International Harvester Co.  
606 S. Michigan Ave. Chicago



a 1944



High-Speed Hydroglider, a Motorboat with an Air Propeller Mounted at the Rear; the Craft Travels Better Than Forty Miles an Hour and Can Be Used in Very Shallow Water

Used Works

### AIR PROPELLER ON MOTORBOAT GIVES HIGH SPEED

One of the latest developments in high-speed water craft is an air-propelled motorboat, or hydroglider, produced in England. It has accommodations for eleven persons and makes between forty and

fifty miles an hour. An air-cooled rotary engine of 140 horsepower is installed in a streamlined housing at the rear, and drives the four-bladed air screw directly as in airplane practice. The use of the air screw enables the boat to run in shallow water where a craft fitted with a submerged propeller could not be operated.

### THREE-WHEELED RACING CARS GIVE AMATEURS A THRILL

Three-wheeled amateur racing cars of extremely light weight and fitted with

aluminum bodies, recently achieved a speed greater than eighty-six miles per hour in France. From the front both have the appearance of the normal automobile except for size. One model was fitted with an air-cooled two-cylinder engine and front drive. The other was water-cooled and was powered by a four-cylinder engine equipped with a standard form of transmission.



Three-Wheeled Race Cars; the One Below Is Driven by the Front Wheels Instead of Rear

### REDUCTION OF IRON CORROSION AIDED BY SOIL STUDY

Reduction of corrosion losses in iron and steel is the object of soil studies by the bureau of standards. Use of less corrosible material and the coating of steel with a material less susceptible to soil action are two ways in which the bureau is fighting corrosion. Several varieties of copper, lead and brass have been found to resist soil action. A lead coating and galvanizing appear to have added life to pipe and to have retarded corrosion materially in many soils.

Journal of Research.  
Washington, D. C. Sept. 1944  
Copyright 1944 by the U.S. Government

a 1951  
Capt. Henry Heck, Civil  
Engineer, 47. Zwenfeller St.  
Stalder.  
Chimelard  
Germany

England -  
British Small  
Arms Soc. Birmingham



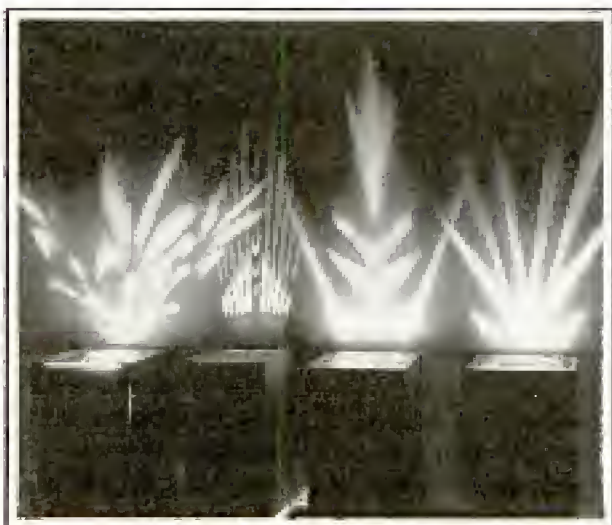
Baltimore, Md a 1973

VARIATIONS IN MAN AND BEAST  
HELD BASIS OF PROGRESS

Variations in all living things form the basis of evolutionary progress. This is the conclusion of Dr. Adolph Schultz, of Johns Hopkins medical school, who explains that no two individuals, no matter how much they may be alike, are absolutely alike in all respects. Without variations there would be nothing to select from, and without selection, there would be no progress or at least no lasting change in, or evolution of, our physical makeup, explains Doctor Schultz. Even twins are not identical. Absolute symmetry does not exist in nature, and control of selective factors is what the scientist seeks to gain in his attempt to produce a better race.

LIGHT PAINTS WALL DESIGNS  
WITH CUT-OUT PATTERNS

Light, projected through cut-out patterns, is being used to produce decorative wall designs. The source of lighting is placed within an inclosed area, painted black to avoid reflections, on which the pattern is placed. The light then throws the design on wall or ceiling. Any design of simple pattern can be cut from thin wood or wallboard. Designs in color may be projected by placing colored gelatin over the patterns. Mirrors can be mounted beside the lamps, thus throwing the cut-out image in several positions. Dimmers may be used to make parts of the design fade and reappear.



Cut-Out Patterns, Placed over Electric Lights. Produce Unusual Wall or Ceiling Decorations



Iron Bars across Flumes Force Animals from the Water and onto a Ramp

DEER ESCAPE BUILT IN FLUME  
SAFEGUARDS ANIMALS

Deer escapes have been built into water-power flumes in the west to save deer, bear and other animals which get into water either deliberately or accidentally. There are two places at which an animal in the steep-sided flume has no choice but to get out. There the conduit widens from fourteen to nineteen feet and a ramp is constructed at one side. Iron bars across the flume not only prevent the animal from going farther in the water, but steer him onto the ramp and then he has only a few feet to dry land. In both instances the deer escapes lead to actual paths made by deer.

ICE FORMED OVER HOLE IN SHIP  
TO PREVENT ITS SINKING

Forming ice over a hole in the bottom of a ship by refrigerating apparatus is the process recently developed to prevent the sinking of a damaged vessel. The refrigerating equipment is placed over the hole, preventing water from entering, and the machine, working under pressure with ammonia, forms ice which closes the hole.

My James  
10/26/31  
Copyrighted material

Science Service 10/28/31  
Cmt. Miss Mary Laleston 280  
Cherokee Bldg San Francisco  
Calif

Cmt. C. Randolph Yeager  
% Natl Lamp Works  
Nela Park Cleveland Ohio



Q 1901

896

Cont. Emile C. Schürmayer,  
22 E. 69th St. New York

POPULAR MECHANIC

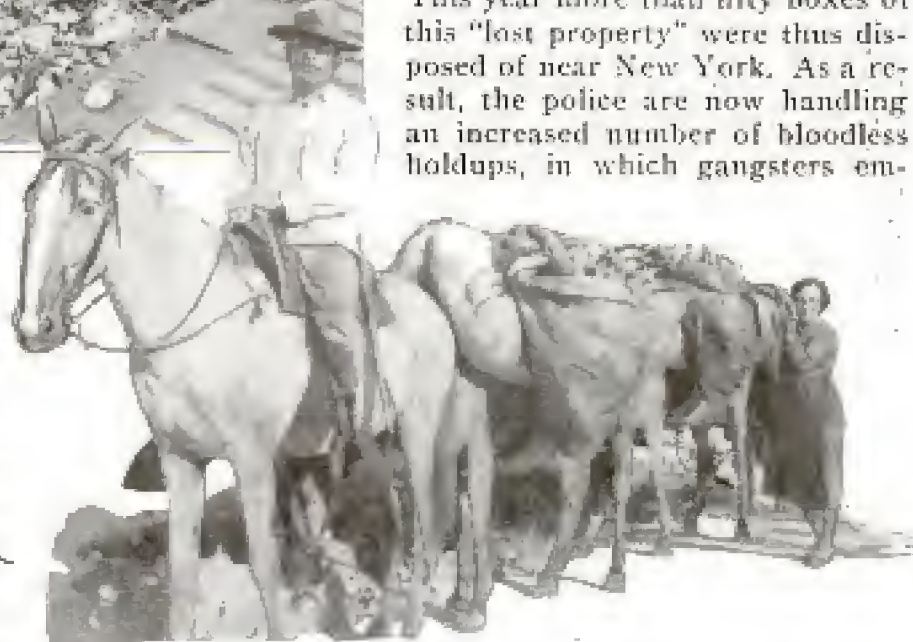
## War on Organized Gun Running for Killers



Above, Dumping Confiscated Weapons in New York Harbor; Right, Pack Train Such as Is Used to Smuggle Guns into Country

During the past year, gangster slayers have discovered to their amazement that ballistic experts have developed an uncanny knack in tracing bullets back to the pistols that fired them, thereby incriminating their owners. Consequently they now go far afield for the weapons they use in killings, and gun running has become an important business of the underworld—an "industry" that extends as far away as Spain and utilizes even Mexican peons. Last year, of the 3,000 pistols seized and destroyed by the police of New York City alone, a very high percentage were of Spanish manufacture or importation. Instead of the adventurous days of gun running into Mexico for revolutionists, guns are now being run out of Mexico for the gunmen of large cities. A "well rubbed" pistol, one whose identity has been care-

fully concealed by removing numbers, etc., may be worth even as much as \$50 to \$100 to a slayer. These pistols, shipped legitimately to Mexico from Spain are smuggled into New York by fruit boats or slipped over the border by peons in bags of produce. One gunning ring located in New York brings firearms to that metropolis in such manner. Once a pistol or revolver has been seized from a gunman, it is destroyed. Bombs, "pineapples," are destroyed immediately, while small firearms, knives, sword canes and blackjacks are collected by the lost-property clerk of the police department, trucked to a scow and taken out to sea to be dumped. This year more than fifty boxes of this "lost property" were thus disposed of near New York. As a result, the police are now handling an increased number of bloodless holdups, in which gangsters em-



played toy pistols, relying on the fear inspired by the sight of a firearm.

### SIGNAL RISES ABOVE RADIATOR IF HUMIDIFIER RUNS DRY

Humidifiers for radiators have been fitted with a flag which rises above the top of the radiator when the water level drops too low to keep sufficient moisture in the heated air of home or office. The signal attached to a float rises on an arm as the water level lowers until finally it protrudes above the top of the radiator.

Q 2012  
A W. M. A. Haroldich  
1821 S. Karlov Ave.  
Chicago



*N.Y. Herald Tribune A 2016 Made by Ray Loper, 1425 North Ave Waukegan, Ill*  
 10/14/31 POPULAR MECHANICS 897  
 A 210 2

# U. S. ISSUES TWELVE STAMPS IN WASHINGTON'S HONOR

Stamps in twelve denominations are being printed by the United States post office in honor of the 200th birthday of the nation's first president, George Washington. The face of Washington, as modeled by famous artists, appears on each of the twelve stamps. The new issues and their colors are: one-half cent, dark brown; one cent, green; one and one-half cent, light brown; two cent, red; three cent, purple; four cent, warm brown; five cent, blue; six cent, orange; seven cent, black; eight cent, olive green; nine cent, pink, and ten cent, orange.

# AUTO WITH AIR-POWER MOTOR COSTS LITTLE TO RUN

Compressed air has been harnessed to operate an automobile successfully at no cost for fuel. The car has a tank for its air, which is carried to the transmission by a small engine resembling a radial airplane motor. There is no cooling system, no carburetor, no ignition system—nothing except the small air motor controlled by the air throttle. There is no noise except a slight hiss from the exhaust. As the air goes through the engine, most of it is recaptured and recompressed.



Filling Up the Air Tank of Compressed-Air Auto; Note the Small Radial Engine



Golf Is Played through the Door of This Model of a Florida Hotel on a Miniature Course

# HOTEL MODEL IS GOLF HAZARD ON INDOOR COURSE

Modeled after a large hotel in a Florida resort city, an eight foot building, six feet wide, with glass windows, roof garden, awnings and other features of a modern hotel, now is serving as a golf hazard on an Illinois indoor course. The hotel model is constructed of vincer and plaster and has electric lights.

# DRIED AND GROUND WIGGLERS MAKE GOOD FISH FOOD

Mosquito larvæ, or "wrigglers," after being dried in the sun and ground to the consistency of sand, make an excellent food for aquarium fish. A Californian has turned a stagnant pond into a source of income by seining the wrigglers at the rate of 100 pounds daily, drying and grinding them and selling them as fish food. The mosquito larvæ in the dried form retain all the original food elements of living larvæ, nothing having been removed except water, which is quickly restored when the food is placed in the aquarium. Fish fed on the dried larvæ grow as fast and retain the same degree of health as those fed on living wrigglers. The food brings more than one dollar per pound.

*Air Power Corp. Ltd. Los Angeles, Calif.*

*Antonia Patria 501 W. Colorado Way, San Gabriel, Calif.*

*mami Isolf Waukegan, Ill*



a 169 7 Cmt H. T. Wilkins Esq  
Columbia, 29, Bear Road,  
Des Moines, Iowa

# DOG HEROES of



Courtesy Julien Peres  
Life-Saving Patrol of St. Bernard Dogs and Monks



By H. T. WILKINS

**E**IGHT thousand feet above the sea, at the very top of a terrible mountain pass, where cold, bleak winter is king from the first week of September till the following July, is a big som-

ber two-story building, the home of brave dog soldiers and black-robed monks who save lost and perishing travelers coming through what is well called the "Valley of Death."

One bleak night, when blinding snow flurries drove before a howling Alpine storm, there came a ring on the telephone connecting the Great Saint Bernard hospice with a station at the bot-



Swiss Airman Who Crashed in the Alps. Saved by the Famous Dogs, and, at the Left, Above, "Barry," Savior of Many Lives



# the "Valley of Death"

top of the pass on the Swiss side.

"Italian refugees passed by here two minutes ago. A woman was guiding them when they crossed the frontier. They say she fell into a hidden crevasse. They tried to find her, but had to give up, because they were being pursued by Italian carabinieri."

"Very well," answered the brother, "we will go out with the dogs and look for her."

There came a haying of big dogs, and soon helmeted figures, picturesquely clad in great fur coats and black woolen gaiters, followed the lead of the St. Bernard dogs. Before them stretched steep slopes covered with great snowdrifts and masses of ice.

Sudden fogs make this trackless region extremely dangerous, even to experienced mountaineers. Even the monks—picked men—do not trust to their local knowledge. They let the dogs lead the way, knowing that their intelligence and splendid powers of scent are the best guides on these icy caves of the roof of Europe, where the snow is often fifty feet deep.

Suddenly, up a slope close to where the tip of the rocky crags peep above the snow, one of the dogs bays and starts frantically to scratch the snow. The assistants, with shovels and alpenstocks, ski



Courtesy Sport and General

Monks on Skis, with the Aid of the Dogs, Patrol the Mountain Passes, Frozen for Nine Months Out of the Twelve

over, and below the white mantle lies some lost person, perhaps the body of the woman they seek.

Strapped to a rude bier, the corpse is carried to the hospice, where it is placed in a solitary stone hut—the morgue of the monastery. For many miles around there is not a stick of wood or a pound of earth to make coffin or grave. The morgue is a natural refrigerator in which bodies are preserved for many years, until perhaps they are identified. Many are never traced.

Ages ago, this famous hospice was built to aid famishing and storm-bound pilgrims, journeying over the terrible peaks and passes from Germany to Rome. By the rule of the order, no one is charged for food and shelter. One hun-



dred beds and accommodation for 300 travelers are available. Its celebrated dogs can track a man by his footsteps, though it may be three days since he passed, and the tracks have been wiped

through the top-floor windows of the hospice, they did not omit to send out the dogs.

If the dog finds a man fallen down a precipice, he runs back or barks to announce



Courtesy Societe Graphique

Family of Potential Life-Savers Getting a Meal: Preparing to Brave the Blizzard, at Left



Courtesy Jules Dorasz

out by more snow. Their pedigree goes back 500 years.

When a sudden blizzard comes down the pass, the monks know approximately what point of the gorge the travelers have reached, and send the dogs ahead to find them.

Standing thirty inches high at the shoulder and weighing about 150 pounds when full-grown, the St. Bernard can carry a heavily built man a long distance. Each dog, with a big wooden flask of wine strapped under his collar, is trained to go out alone as a scout. Even when the monks, as this year, were snowed in for eight months and could leave only

the discovery. Then the rescue party goes out. In stormy weather, no visitor is allowed to leave the hospice, unless one of the dogs accompanies him down the trackless white way to the valley.

The methods of training the dogs are interesting. In the brief summer, the monks take the young dogs down into the valleys where there is snow the sun cannot melt. One man lies down and buries himself in the snow. A dog is sent to look for him. The animal is taught to bark when he finds the man, and to wake him from the deadly snow sleep, by licking him till he stands up. Then the St. Bernard runs on in front, to show him the way to the hospice.

There is more than one kennel at the hospice dating from the days when an avalanche overwhelmed all the dogs except three, from which a new race had to be bred. High prices have been offered for the finest dogs, but the monks are adamant in refusing to sell. It is a fact that the light reflected from the snow has so seriously damaged the eyesight of the St. Bernard dogs, that some scientists predict the breed may become extinct.

One famous St. Bernard named "Barry," who saved the lives of forty men,



was scouting one wild day, when news came that a young Swiss soldier had been lost two days before. The big dog picked up the scent, forty-eight hours old, and finally paused before a high bank of ice. Here he dug until he uncovered the waxen face of the dying soldier. The dog licked him as he had been trained to do, when the dying man started up, and mistaking the big St. Bernard for a wolf, stabbed him to the heart with a bayonet. Near the monastery, there is a monument to "Barry," which reads:

"He saved the lives of forty persons. He was killed by the forty-first."

A descendant, also named "Barry," has saved three lives, while around the fires of the monastery kitchen, are seen basking old dogs who have each saved twenty lives.

Q2045

## LIGHT ON RADIO MAP MARKS STATION

Tiny electric lights on a radio cabinet map are turned on as the dial is turned, marking the location of the broadcasting station to which the radio is tuned. When the operator turns the dial to a position coinciding with the wavelength of a particular station, the tiny lamp at that station's position on the map lights up. Seventy stations are so marked for the convenience of those who tune in a station broadcasting in an unknown language.

the message



Courtesy Maj. E. N. Whittington  
When a Station Is Tuned in, a Light Flashes on the Map, Showing Location of Broadcaster



How Passengers Are Taken off Liners and Put Aboard Shore-Going Boats at One South African Port

## BASKET LIFTS THE PASSENGERS FROM LINER TO TENDER

Passengers who wish to land at East London, Africa, where liners have to anchor in the open harbor, are lifted from the ship to a shore-going tender in a huge basket suspended from a derrick. The basket method of transferring passengers was adopted as the safest in all kinds of weather.

## HIDDEN SUN FOUND BY SEXTANT IN CLOUDIEST WEATHER

Clouds and fog cannot hide the sun from an all-weather sextant recently invented. The instrument enables the navigator to determine the altitude of the sun above the horizon, regardless of weather conditions, by detecting the infra-red radiation of the sun. An amplifier connected to the sextant proper by two small, flexible rubber-covered cables is used to detect the sun's heat rays.

Mr. Paul H. Maxwell,  
1 Huntington, 2nd New York

Arum Electrical Supplies Ltd  
35, Leavis St, London W.1, England



*Chas. W. Seales & Underwood / Corn Llam, valley of  
San Francisco*  
902  
a 2037 *copy* POPULAR MECHANICS *Evitts Creek, Bedford  
County, Pa.*

**MUSIC FOR ALL INSTRUMENTS  
WRITTEN BY ELECTRICITY**

*Seales & Underwood  
Park Hotel, Rock'd Springs, Wyo.*



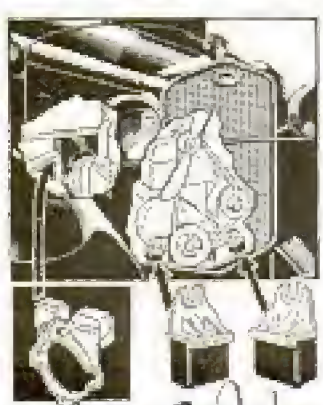
*Life A Time*  
International News Photo  
Music Writer, Which Produces Harmony Parts for  
Orchestra, Recording from Composer's Piano

Harmony parts for each instrument in an orchestra are produced by an electrical music writer which makes it possible to compose music and record it by simply playing over the composition on the piano. The invention also produces sheet music of the melody of the selection.

**LIVE-RUBBER ENGINE SUPPORTS  
FOR SMALL AUTOMOBILES**

*Chicago, 5-4-35  
a 1994*

Motor vibration in Ford cars can be virtually eliminated by the use of absorbers in the form of live-rubber suspension supports for the motor. This engine mounting insulates the body of the car from vibration by means of three-point suspension. Two of the units are placed under the front motor-support bracket, effectively cradling it



on blocks of rubber an inch thick. The third unit fits over the universal housing, with its rubber cushions resting on the frame crossmember. In this way, the motor is supported at both

*Corogone Co., Harwin  
Bldg. Cleveland, Ohio*

ends, eliminating rumble and deceleration noises, as well as much clutch chatter and gearshift and emergency vibration. The equipment also makes possible more positive brake action and smoother stopping and starting.

*a 2090*

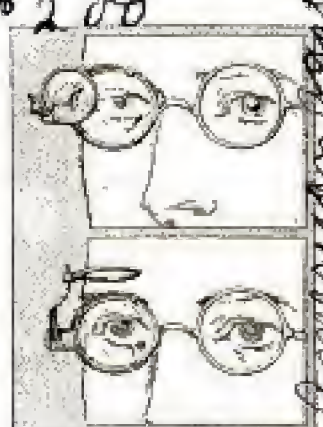
**DAM TO BE WEIGHED AS TEST  
OF CONCRETE MIXTURES**

All ingredients of materials used in construction of a 726-foot dam in Pennsylvania will be weighed automatically in engineering tests of concrete mixtures. A special scale, which will do the weighing, controls the flow of materials, automatically cutting off the flow when the correct amount of each ingredient has entered the concrete hopper. The actual value of moisture contents of concrete aggregates thus will be definitely determined.

*a 2006*

**MOVABLE MAGNIFIER FITS RIM  
OF SPECTACLE FRAME**

For persons who require frequent aid of a reading glass, a small magnifying lens is being made mounted in a frame which attaches to the rim of a pair of spectacles. The magnifier can be pulled down in front of the spectacles, or pushed up out of the way quickly. For those not wearing glasses, but having occasion to use the magnifying lens, it can be mounted on frames without spectacles. It can be obtained for either the right or left eye and for a focus of from two to five inches.



**SAFETY MATCH CAN BE STRUCK  
TWO THOUSAND TIMES**

Two thousand lights from a single match is possible with an English invention, which calls for one chemical for striking the match and another for putting out the flame. There is no danger of part of the match head breaking off and burning the person striking it. Considerable saving in match wood may result.

*Ing. M. M. Ferdinand  
Renger Chemical  
Vernon, Austin*

*114 W. Medical Ave  
American Optical Co  
Casper, Wyo.*

*a 2403  
Feb 16/3/5  
see April 1931 - 579*



@ 16/11 Cont. *Uthas Vincent Wilson*  
1331 Es St. N.W. Suite 608  
Washington D.C.



Measuring the Evaporation of Snow on the Cornice at the Summit of Mt. Rose; at the Left Is Seen the Shelter for Certain of the Measuring Instruments

**W**HAT of next year's water supply? Will it be adequate for crops, for city consumption, for wells? This has been in very recent times a matter of prime importance.

Some forecasts on this subject have been little better than guesses. Now a new era has arrived with the introduction of "snow surveys." The largest share of our water supply comes from the snow. But just how much water does snow contain? Prof. J. E. Church, Jr., has been interested in finding out, and recently has developed a method of ascertaining the value of snow in accurately estimating future water supplies.

The methods of the snow surveyor are entirely different from the old plan of sizing up the mountain snowfields. The procedure now consists in determining the water content of the snow cover, along suitably selected "snow courses" in each river basin, by cutting and weighing sam-

ples of snow at intervals along each course, these measurements being made at the same points every year. The results of the survey are compared with normal, based on the records of previous seasons, and an indication of the run-off from the melting snows is thus obtained.

The technique now employed in California is more or less typical. Preliminary surveys begin in midwinter, but the main survey, which includes all courses, is made in April when most of the winter's snow has fallen but the spring melting has hardly begun.

Snow courses vary in length from 500 to 5,000 feet and are located with a view of obtaining measurements representative of the whole basin. The site chosen must be one where the snow lies uniformly and which is relatively free from steep slopes and surface irregularities of all kinds. A course may be straight or it may be turned at various angles to avoid obstruc-





tion. Within a few years after the work is begun, all courses are definitely located and marked.

Measurements are made at exact intervals of twenty-five feet on short courses and fifty or 100 feet on long, the positions being determined by the tape measure. The surveyors travel over the basin singly or in pairs, the trips over the snowfields from course to course being made on snowshoes or skis. Their work is dangerous and always strenuous. Shelters and places of refuge are now being provided, stocked with blankets and provisions. These are located ten or twelve miles apart.

The measuring outfit consists of a snow sampler and a spring balance scale. The sampler is a light, jointed steel tube having a serrated cutting edge to facilitate driving it through the snow. The tube is made in five-foot sections, which can be coupled together to form a sampler long enough to reach the bottom of the deepest snowdrifts. Narrow slots cut in the walls of the tube provide windows through which the column of snow within may be observed and through which a tool for cleaning out the snow may be inserted.

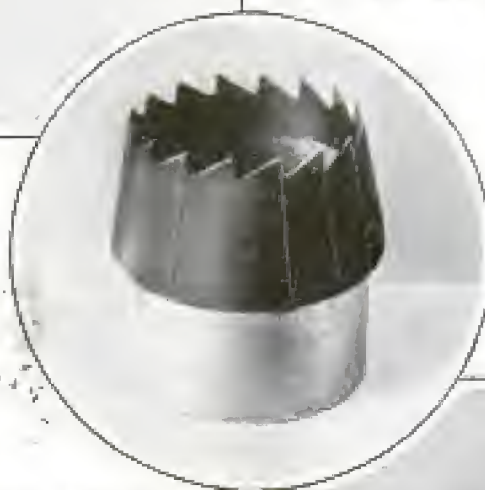
The outside of the tube is graduated in inches.

In taking a sample, the tube is driven vertically down through the snow with a steady thrust and without twisting except when ice crusts are encountered. The surveyor can tell when the ground is reached by the feel. After bottom has been reached the depth of snow is read and recorded. The tube is then twisted to break the snow core from the ground and is withdrawn by pulling vertically upward with a steady motion.

A complete core of snow is brought up inside the tube and this must next be weighed to determine its water content.

After completing the surveys, which take several days, the average water content of the snow lying along each course is computed from the individual readings,

and the data for all the courses are then combined to obtain a figure for the entire basin. The figure can be expressed as a percentage of the corresponding figure for a year of normal water content, and the prediction of run-off assumes



Sampling the Snow; Snow-Cutter Head, and Driving Sampler Deep



that the latter will vary from the normal in a similar ratio.

The results of the main survey provide the basis for a forecast of the total seasonal run-off, covering the period from April to July or August. With the help of supplementary surveys made at certain key points once a month, both before and after April first, together with information concerning the rainfall, temperature and state of the ground, the experts in charge of this work can predict with considerable accuracy, in addition to the total run-off, the details of its distribution through the season.

In the semi-arid west, where the storage and regulated distribution of water play a part in some of the leading industries, the value of the advance information obtained through snow surveys is obvious. Such information enables the irrigation districts to estimate the acreage that can be irrigated and the rate at which water can be furnished from reservoirs without risk of shortage; it guides the farmers of irrigated lands in selecting crops and planning the season's work; it indicates to the hydroelectric companies whether their plants can be operated to full capacity, and it has also a number of other important applications, including the prediction of floods. This method of surveying is now being used by all the western states.

#### MITE TRAP FOR CANARY'S CAGE KEEPS BIRD HEALTHY



trapped and destroyed. The trap can be left in the cage indefinitely and will keep the songster free of mites for life. The only care required is an occasional cleaning of the glass ball.

Ch Morley  
Patchogue, NY

#### LOG OF WOOD MAKES CLOTHES ENOUGH TO DRESS ONE

Girl with Log of  
Wood Approximately  
the Size Needed  
to Make Silk for  
Her Clothes



Emil Eckhardt  
From Philadelphia Textile School.

With production and consumption of rayon increasing rapidly throughout the United States, the question has arisen as to just how much wood a woman carries when fully dressed. Calculations by textile experts show that the average-sized woman requires a log approximately the size of the one shown in the accompanying photograph to make her clothing. It is estimated that about one-third of the undergarments sold to men and women are made of rayon. Rayon is a synthetic textile prepared by several different methods from wood pulp or cotton linters. The wood or cotton is formed into a viscous fluid and then forced through minute openings in the form of filaments which are hardened into threads which are spun, dyed and woven into fabric.

Rayon Institute of America  
225 W 34th St  
New York



Q2086 Cmt. Elm Islandman.  
5:50 86 ct  
mural

# The MAN who Made

EDISON, known in his lifetime as a prophet of invention, who did more than any living man to make the world a better place to live in, has been raised by death to a place among the immortals.

"I consider Thomas Alva Edison the greatest single benefactor of the human race since the dawn of history," declares Dr. Lee DeForest, inventor of the grid vacuum tube, foundation of modern radio.

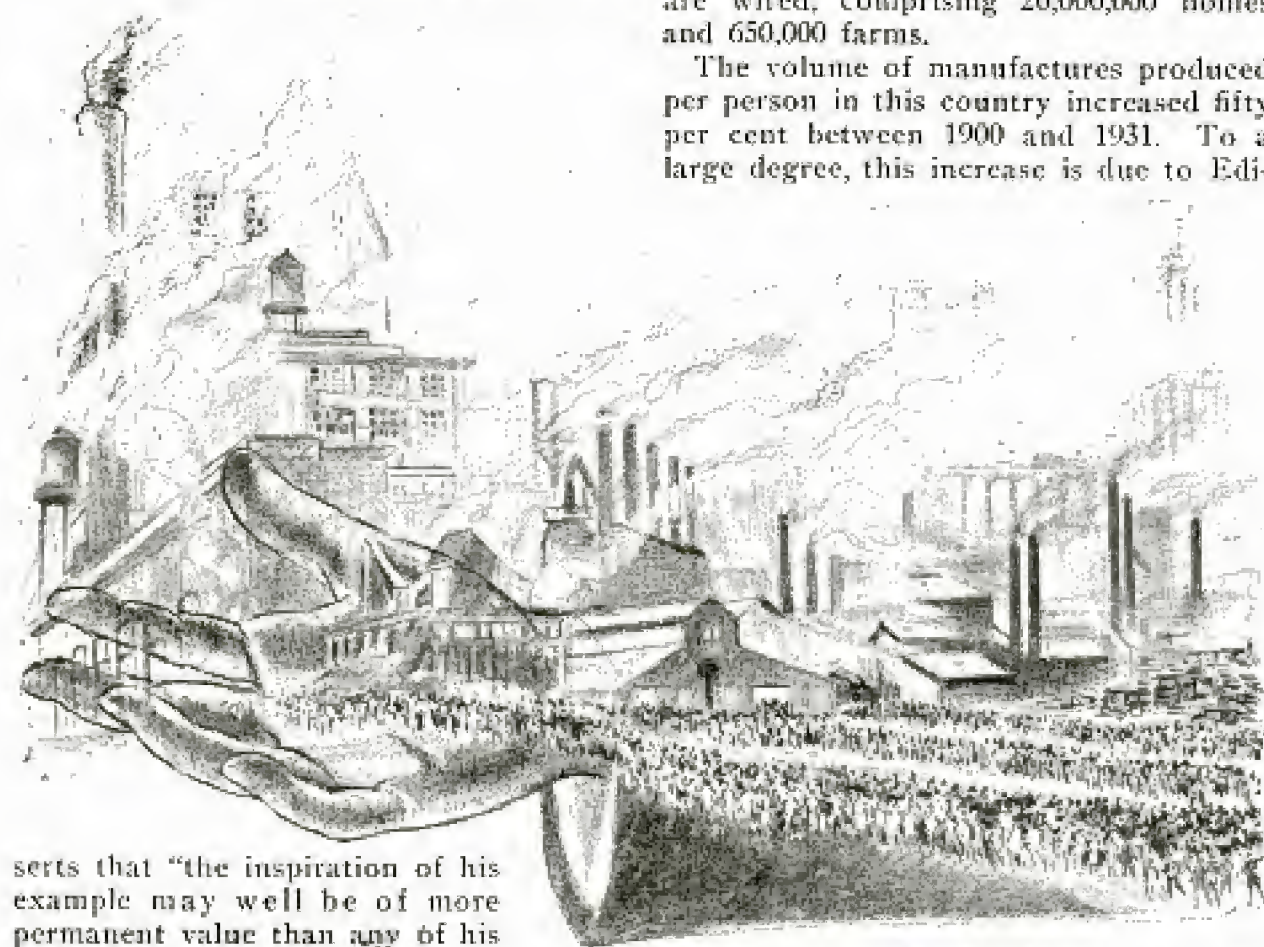
Although Edison's genius has created billions of wealth and given employment to millions of men, Dr. Harrison E. Howe as-

Wetmore, of the Smithsonian Institution.

At the dawn of the electrical age, a little over fifty years ago, Edison appeared like a heaven-sent pioneer. In 1882, he created the electrical lighting system, which has not experienced an essential change since that time, thus laying the foundation for the electric-light and power industry.

In 1930, the electric-light and power industries added 550,000 customers and \$850,000,000 to their investment, giving employment to increased thousands. Today, seventy per cent of American homes are wired, comprising 20,000,000 homes and 650,000 farms.

The volume of manufactures produced per person in this country increased fifty per cent between 1900 and 1931. To a large degree, this increase is due to Edi-



serts that "the inspiration of his example may well be of more permanent value than any of his multitude of inventions."

"Edison's life is an inspiration to all young men who have their own way to make in the world," declares Dr. G. K. Burgess, director of the bureau of standards. "His genius for leadership, his energy, and his tenacity of purpose, have contributed more to the progress of the world than those of any other person of his generation," adds Dr. Alexander

son's electrical inventions, and they account also for America's supremacy in the markets of the world. Although we maintain the highest wages and standards of living, American-made products sell faster in open competition than those of any other country. And the reason may be found in these vital statistics: The annual current output of the world one year ago was 300,000,000,000 kilowatt-

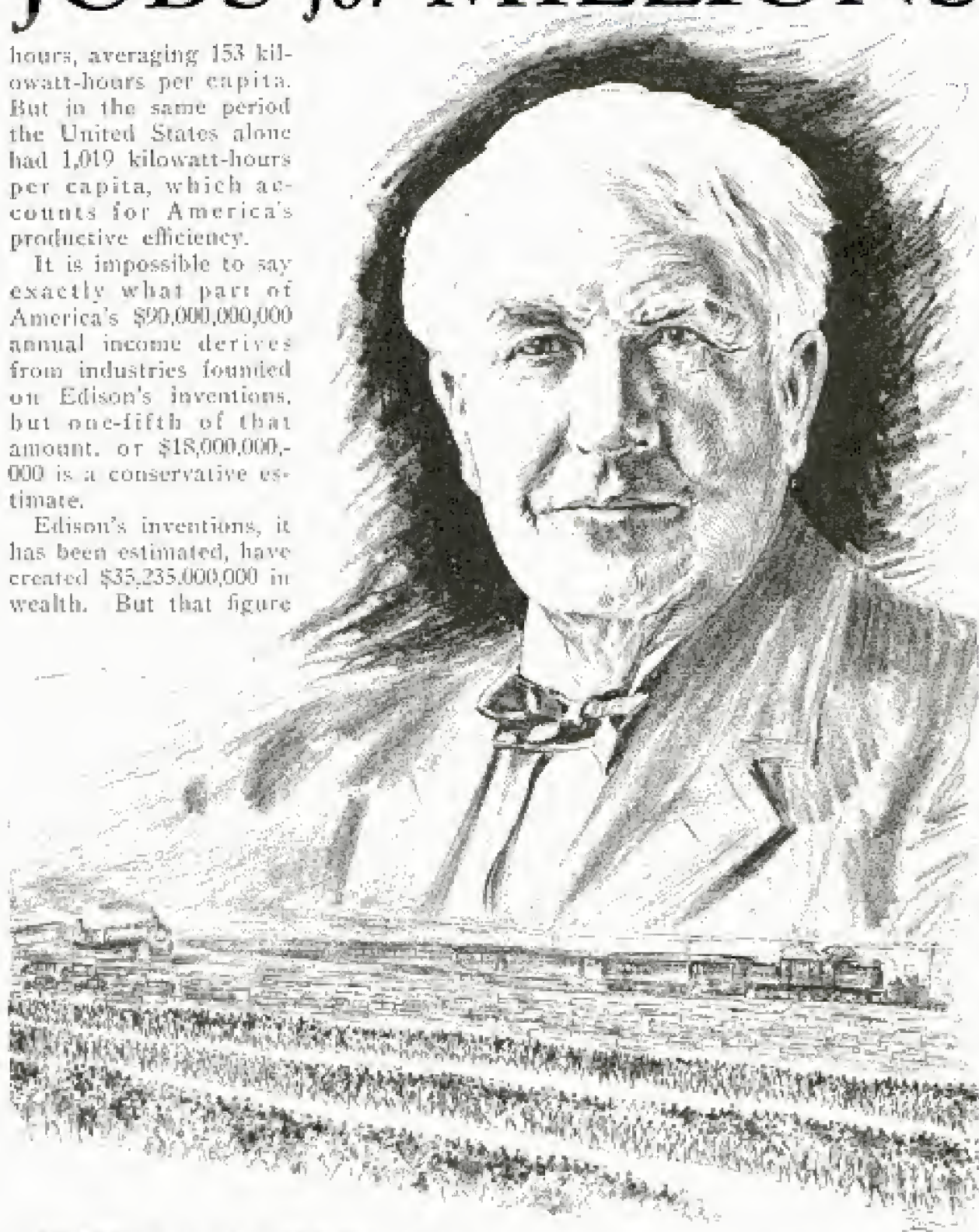


# JOB*s* for MILLIONS

hours, averaging 153 kilowatt-hours per capita. But in the same period the United States alone had 1,019 kilowatt-hours per capita, which accounts for America's productive efficiency.

It is impossible to say exactly what part of America's \$90,000,000,000 annual income derives from industries founded on Edison's inventions, but one-fifth of that amount, or \$18,000,000,000 is a conservative estimate.

Edison's inventions, it has been estimated, have created \$35,235,000,000 in wealth. But that figure



is based only on the investment, or capital, of certain industries in America. It is impossible to calculate how many millions of jobs and hundreds of billions of dollars this one man created out of his own brain. The moving-picture industry over the world involves no less than 500,000 people

and the investment probably runs up to \$5,000,000,000. The world carries on 35,000,000,000 telephone conversations annually through a system which involves an investment of another \$2,000,000,000. The electric railways of the world are stead-





ily displacing all other forms of rail transport. Their value approximates \$15,000,000,000. The phonograph has suffered by the advent of radio; nevertheless, the world has invested \$200,000,000 in that industry. The manufacture of dynamos and motors involves another \$3,000,000,000; the cement industry, \$1,000,000,000, and telegraphs, \$2,000,000,000.

The epic of frozen music and speech began with Edison and his invention of the phonograph. He was experimenting with a telegraphic repeater when he heard a musical note. A strange idea sprang into his head, and before he could forget, he wrote, "there's no doubt that I shall be able to store up and reproduce automatically at any future time the human voice perfectly."

Toward the end of his days, when Edi-

son was asked how he felt, he said, "Like a two-shift man always feels—well! My philosophy of life is work. Bringing out the secrets of nature and applying them for the happiness of man. Looking on the bright side of everything."

Only the human tributes of his fellow men can best express mankind's debt and its appreciation of Edison.

Walter P. Chrysler says: "Service to humanity is the ideal of modern civilization—Edison is greater than any material thing he has ever put together, and the example of his life has a higher



Above, One of Edison's Early Inventions, a Megaphone for Long-Distance Speaking and Hearing; Below, His Method of Killing Cockroaches

value than any of his achievements."

Owen D. Young: "Edison is the personification of the industry. A vision of a great service to be performed; a faith that it could be done. Unremitting toil, unexampled ingenuity; persistency and patience, finally crowned with accomplishment. Work, work, work!"



# "FROZEN LIGHT" MAKES SCREEN GLOW AFTER THAWING

Experiments that may lead to discovery of means of storing energy by freezing recently showed that the light-giving properties of certain substances can be preserved by this means. There are substances which glow brightly when exposed to the invisible rays of the cathode tube. These are used to coat screens upon which the rays will then show their presence. Almost as soon as the rays cease, however, these screens lose their glow. One of the screens was made to glow brightly and was then treated with liquid air. The screen lost its glow and was packed away. When, later, it was brought out, the glow returned as brightly as ever.

## SCOOTER MADE LIKE A CHARIOT WILL NOT TIP OVER

Low-slung and well balanced, a combination scooter, wagon and chariot, which will not overturn, has been placed on the market. The toy has the appearance of a small chariot and is propelled like a scooter, with one foot resting on the footboard while the other provides the motive power. By slipping out the removable dash, the wagon has capacity for two passengers. Oversize balloon tires, roller-bearing wheels and extra-heavy casting for the handle shaft are other features. Sharp turns can be taken at good speed without tipping over.

Built Low and Well Balanced. This Scooter Wagon Carries Two Passengers without Danger of Tipping Over



The National Mfg Co  
Lincoln, Neb



Warm Air, Drawn from Above, Is Fanned over Fruit Trees to Guard against Frost

## ARTIFICIAL WIND IN ORCHARDS PROTECTS AGAINST FROST

Artificial winds, created by large electric fans built on towers, are protecting California orchards from frost. The fans are set on a carriage which rotates about the top of the tower, making one revolution every six minutes and insuring uniform distribution of air over the trees. The principle of this equipment is based on the fact that air in the San Joaquin valley, where the tower fans have been tested, is several degrees warmer above the trees than at the ground. So, at twenty to thirty-five feet, the fans actually raise the temperature of the orchard by pulling warm air from above and sending it down on and into the trees. One fan, say the makers, will protect ten acres of trees against frost, at a fraction of the cost of setting and maintaining smudge pots. Another advantage over the latter is the absence of dirt, that often settled upon the trees from the smudging process.

Used by Warren Tour.

citrus groves San Joaquin valley  
Calif

Metad from H. A. Morrow, Jr. Pa  
Hughesville. Pa



a 1739 Only Wing Plane

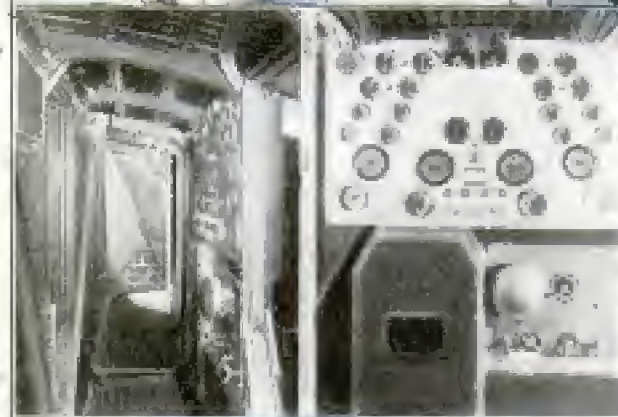
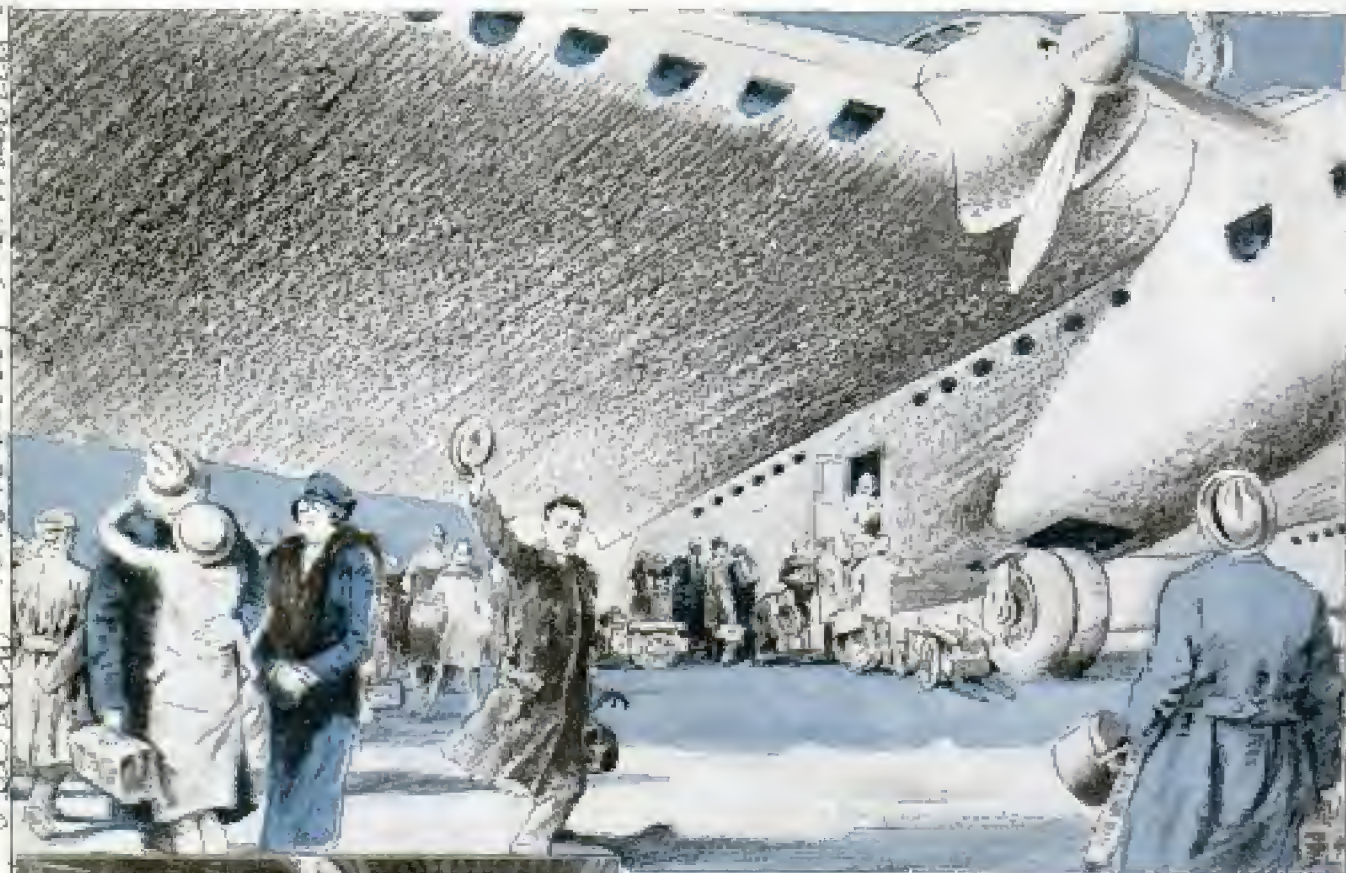
910

POPULAR MECHANICS

Junkers Island at Hesseau Germany

# Passengers to Be Carried in Wing of Giant

Emb. Hans J. Kutzschbach, Schwarzburg Hofpergasse  
171, 6 Berlin-Lankwitz-Landwehr



THE giant "J-1000," called the "Super-Duck" because of its appearance, is to be built shortly in Germany. The big ship really is a "flying wing," inside which the passengers will be housed. Above is the artist's conception of the start of an ocean flight. At the left is seen the passageway inside the wings of the mammoth "G-38," built much like the "Super-Duck," and below, how passengers will

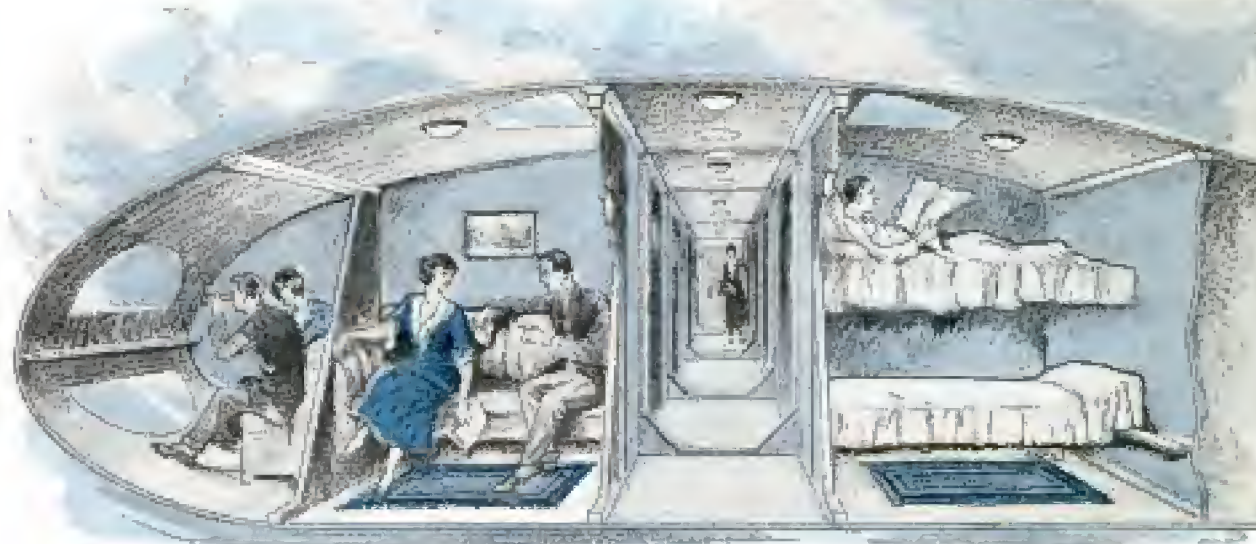




# "Duck" Being Built for Flight Over Atlantic



enter. As can be seen above, the stabilizer of the air giant is to be placed forward of the wing instead of behind it. The undercarriage is expected to be constructed so it can be drawn inside the ship while in flight. Details of the "G-38" undercarriage can be seen at the right. The interior arrangements for passengers of the "J-1000" are shown below.





*Dr. W. David Es*

*Used by Mr Edwin R. Jaynes and Mr H. W. Weighart at Bell Telephone Lab.*

*a 1983 912*

*Earl*

# POPULAR MECHANICS

*Long Beach, Calif.*

## MIRROR SET IN TELLER'S CAGE FOILS BANK ROBBERS



Bank Teller's Cage Fitted with Mirror to Foil Robbers; Diagram Shows How It Works

To foil bank robbers, a teller's cage in which a mirror is set at an angle has been devised, the teller being out of sight and out of reach of the customer appearing at the window. When a bandit approaches the cage, he sees only the reflection of the teller in the mirror. Actually the bank official is standing to one side of the window within easy reach of a gun that is placed in a turret so it is trained on a position in front of the wicket where the bandit stands. Two sets of wide bars prevent a robber from reaching through the window and shooting around the corner at the teller.

## POISON SPRAY GUARDS PLANTS FROM INSECTS AND FUNGI

Performing double duty in plant protection, a poison spray, made by improvement of pine-tar oil distilled from "fat" stumps and old logs, has been discovered. The spray not only kills insects, but also checks the growth of fungi. Hitherto, this forest waste product had been known

to possess insecticidal value, but could not be applied to plants because its acids poisoned the foliage and often killed the plant. New processes now eliminate the acids, making the oil harmless to plants.

*a 2069 195*

## AIR LEFT IN "PERFECT" VACUUM MEASURED BY MOLECULES

Millions of molecules of air are left in the best vacuum known to man after the most powerful pumps have taken out all the air possible. The amount of air left in such a vacuum has been measured by an instrument, which shows that there are 500 million molecules in every cubic inch of the vacuum. This seems a lot, but it is, in fact, only one three-trillionth of the original amount of air. Measurement of the best vacuum is important in the manufacture of photo-electric and other vacuum cells, in which the emission of electrons from a metal surface is hindered by the presence of the least gas.

*a 1193*

## SIMPLE TYPE OF ELECTRIC EYE MEETS AMATEUR'S NEED

Photo-electric-cell equipment has been brought within the reach of amateur experimenters by a simplified form of electric eye just placed on the market. This cell, called the "photronic" cell, is low in cost and does not require the usually expensive auxiliary equipment. So far as the makers know, the life of the cell is practically unlimited, and a continuous flow of current does not harm it. The cell contains no liquid and does not require vacuum or gas, so there is nothing to get out of or



der as it is not subject to physical or chemical change. Its output is constant and its response to light variations is instantaneous. The cell employs a highly light-sensitive disk which transforms light energy directly into electrical energy without the use of auxiliary voltage.

*Dr. E. A. DeAng, with Baldy Montgomery and Bush H. San Francisco*

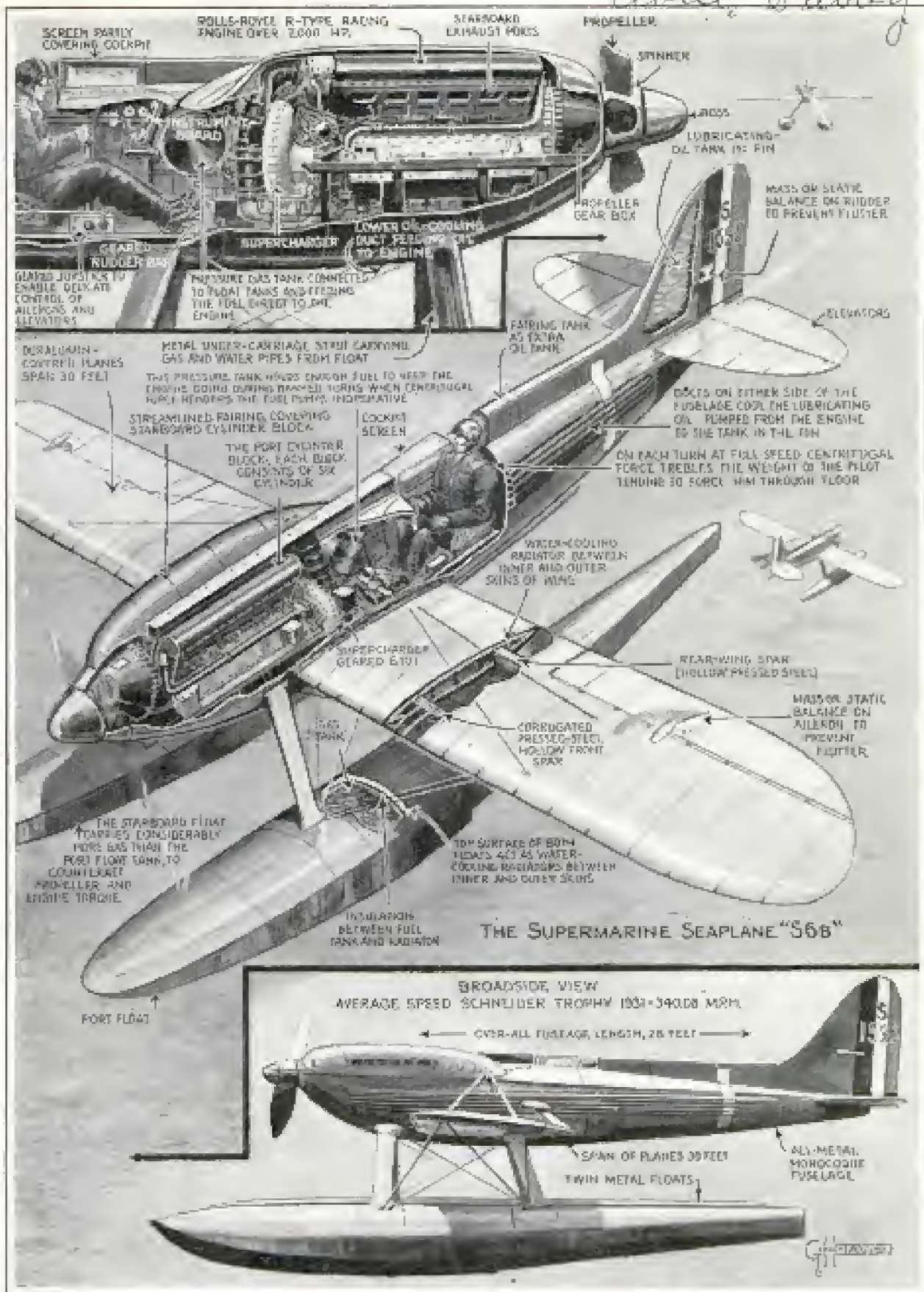
*a 2019*

*studied by Dr. E. A. DeAng, Consulting Entomologist, San Francisco, Calif.*

*Weston Electrical Instrument Corp. 619 Frelighway, Newark, N.J.*



a 2068 Coyt. Lt. H. Davis, Esq.  
 "Limmer" Hillside Road,  
 Weymouth, Surrey, Eng.



After Assuring England Permanent Possession of the Schneider Cup by His Speed of 379 Miles per Hour, Flight Lieut. G. H. Stainforth, a Few Days Later, Set a New World's Air Record, 408.8 Miles an Hour, Almost Seven Miles a Minute; the Plane Was Equipped with a Special Engine Burning a Mixture of Gasoline and Alcohol and Having But a Few Hours' Life at This Terrific Speed



A 1627

Cont. John F. Coggeswell,  
16 Edgemoor Road  
Belmont Mass

# FINGERPRINTING



**I**F there be a single weak link in the chain of facts, presenting technical evidence to a criminal-court jury is always hazardous to the state's case. All points must dovetail to a nicety, and all of them must be unassailable and easily understood. The slightest doubt cast upon a single bit of the technical testimony is more than likely to sweep the whole presentation aside in favor of less reliable but more clearly comprehensible evidence.

A roadside-stand operator had been shot to death during a robbery. Capt. Charles J. VanAmburgh, firearms expert of the Massachusetts department of public safety, on the stand for the state, had built up a beautiful case. The technical evidence laid out a clear trail of guilt connecting the mortal bullet, the revolver that had fired it and the man accused of the crime.

"Then, Captain VanAmburgh, you can state positively that this bullet, marked 'Exhibit 1,' was fired from this revolver, marked 'Exhibit 2?'" was the prosecutor's last question before turning the witness over to the defense for cross-examination.

"I can," answered the expert and then braced himself for what he knew would be a skilled and crafty cross-examination,



Powder Smudges Can Be Seen around Two Chambers of This Revolver Used by a Killer

for another noted ballistics expert sat with the defense attorney, ready to supply the latter with questions tending to cast doubt upon VanAmburgh's testimony.

"You have testified that careful measurement of the marks of the barrel rifling on the mortal bullet shows that it was fired from a revolver with a rifling twist of one turn in 16.24 inches," stated the defense attorney and the witness agreed.

"Then how can you state that it was fired from this revolver, alleged by the state to be the one that figured in the crime? According to the description sent out by its maker, this model is always rifled to a twist of one turn in exactly



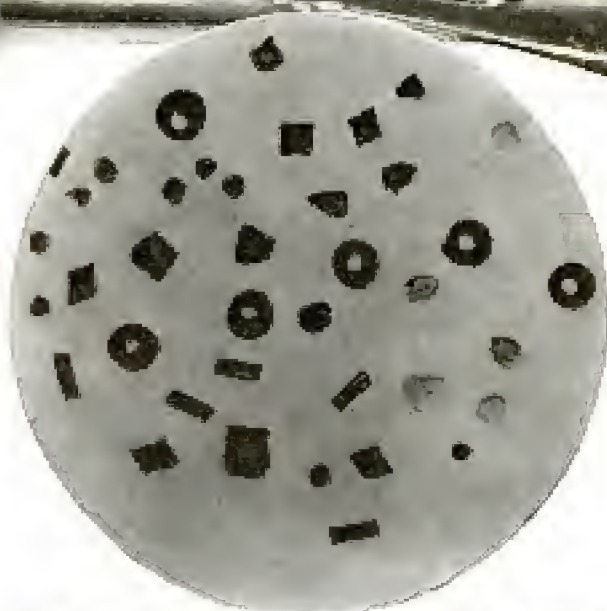
# *the* GUNS of CRIME



sixteen inches, not 16.24 inches. Certainly, then your own testimony shows that this revolver could not have fired the bullet in evidence."

A few months ago this would have been a poser for any firearms expert, for there is no denying that the gun is supposed to have an exact pitch of one in sixteen. But experts know it is beyond the range of human and machine precision to manufacture two revolver barrels exactly the same, to a hair's breadth, in every detail.

For a long time there had been no accurate method of exactly measuring the rifling pitch of any particular gun. By sawing the barrel in two lengthwise, measuring the lands and grooves with

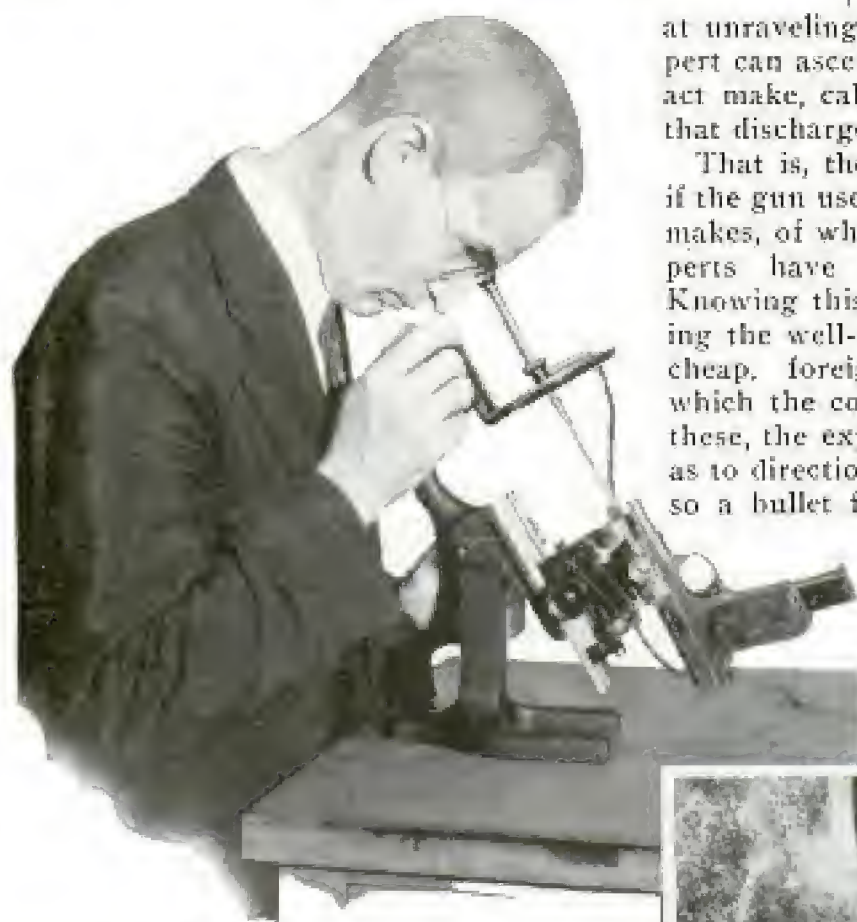


Collection of Guns Sent in by Citizens; Below, Each Brand of Powder Has a Different Grain

micrometer exactness and then working out an involved mathematical process, the expert could arrive at the approximate pitch, but that was all. Furthermore, no gun placed in evidence could be mutilated in this manner.

However, in this case Captain Van-Amburgh brought into court an apparatus that he had labored for several years to perfect and had only received from the makers a few days before. The ballistics authority has named this new device the microprotractor. It is, firearms experts agree, the last connecting link necessary to make their testimony air-tight and unassailable. It makes positive the relation between any discharged bullet and the gun barrel from which it





was fired. A tiny electric light, at the end of a rod, illuminates the interior of the barrel. With his eye to a magnifying lens, the expert sets the marks on a sliding micrometer-eyepiece scale to coincide with the edges of the rifling land—the raised section of the twist. The scale points are moved along the land edges for a certain distance. The movement actuates a circular scale, from which the exact rate of rifling pitch can be read directly.

A demonstration before the jury, in the case under discussion, convinced them that the mortal bullet had been fired from the revolver seized from the defendant and clinched the case for the state. Hitherto, the experts have had to rely upon the proof furnished by test bullets fired from the suspected gun, but now the relation between gun barrel and mortal projectile is direct.

However, the inventor does not deem the preparation of evidence the most important service that the new instrument will render in the fight against crime. In any murder by gunfire, there is one piece of evidence, the fatal bullet, that must be left behind. That bullet always furnishes the investigating detectives with a start

at unraveling the case; the ballistics expert can ascertain in a few hours the exact make, caliber and model of the gun that discharged the projectile.

That is, the information can be given, if the gun used was one of the recognized makes, of which, in tabular form, the experts have full detailed information. Knowing this, organized crime is forsaking the well-known makes and taking to cheap, foreign-made hand arms with which the country is being flooded. Of these, the experts have little information as to direction, depth and pitch of rifling, so a bullet from one of them is nearly worthless as a clue. One of VanAmburgh's first pieces of work with his new instrument will be the furnishing of this information to other ballis-



Measuring Ridges in Gun Barrel, Above, and a Slayer's Fingerprint

tics experts throughout the country. Already he has collected samples of all the imported firearms. He will make careful measurements of all details of the barrel interiors of these weapons and prepare tables for distribution, a distinct service in the battle against gangster crime.

In one gangster murder, mortal bullet, gun and slayer were linked together so quickly and effectively that it left the expert fairly gasping. The members of the gang were gathered about a gambling ta-



ble in their headquarters. Suddenly the door burst open and a hail of bullets raked the room.

The racketeer leader was killed almost instantly, and three of his men were wounded. When the police arrived, a few minutes later, the invaders had disappeared, but a trail of blood leading down the stairs indicated that one had been wounded. A half hour later, a man suffering from a bullet wound was left at the emergency entrance of a near-by hospital.

That was the condition of affairs when VanAm-burgh was summoned to the scene. The medical examiner removed the fatal bullet from the dead gang leader. Under the stairway was found



Microprotractor Expert Measuring Gun Barrel, Top, and View of Inside of Rifle Barrel

with test bullets showed conclusively that the mortal bullet had been fired from the automatic found under the stairs. Then marks on test cartridges were found to match exactly those on the shell found in the wounded gangster's pocket. The chain of evidence leading from the fatal bullet to the discarded pistol and thence to the man in the hospital was complete within four hours after the killing.

91919

## GROOVER HAS ELECTRIC MOTOR WITH SAFETY SWITCH

Designed especially for weatherstrip work, an electrically operated grooving tool now on the market, has an adjustable handle, a safety switch and perfect balance. The switch operates automatically, releasing when grip is relaxed. High-speed cutting by electricity results in better work, the grooves being clean.



an automatic pistol, evidently cast aside by the fleeing killers. By the time the automatic and the mortal projectile had arrived at his laboratory, the clothing of the wounded man in the hospital had reached him.

The inside of one coat pocket was blown out and charred on the inside; evidently the wearer had fired a shot from a gun without removing it from his pocket, a conclusion verified by the finding of a discharged automatic pistol shell in the lining.

The microprotractor and comparison

Speedway by C 1834 S  
52nd Ave  
Acero. d. 9

404  
Tupper



918

POPULAR MECHANICS

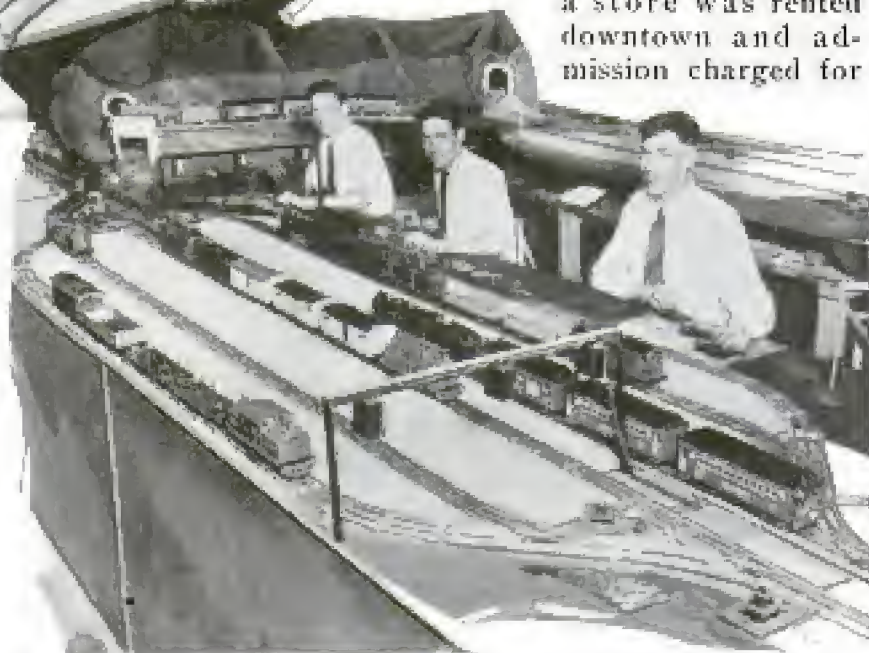
Winn. Jack and Ed Moulton.  
don't log on West Atlantic  
book of 2 pages in



Above, Novices among the Patrons Are Given But One Division to Operate; Right, It Takes Skill and Training to Operate Parts of the "Male Line"

Three youthful brothers in an eastern city are operating two miniature railway systems in a downtown store that pay them a real profit. The trains are of all types, including passenger, freight, locals, limiteds and "transcontinental." It takes more than thirty operators to run the systems at one time. Altogether there is 700 feet of track in the two systems, and they run through tunnels, over bridges, climb mountains and make hairpin turns.

In some spots the tracks run six wide. There are thirty-six switches, nine locomotives and six signal towers. The main line is controlled through electric block signals, while semaphores guard the traffic on the branches and sidetracks. The brothers have more than a thousand dollars' worth of equipment. The venture started in an attic and proved so attractive to neighboring boys that a store was rented downtown and admission charged for



anyone who wished to operate a section of the system. A profit was made the first day, and the number of patrons has increased every week since the start.

## SWITCH "THINKS" FOR ITSELF AND SHIFTS WITH SEASON

An industrial alarm clock, recently developed by a General Electric engineer, seems almost to think for itself and adjusts its movements to fit the season of the year. If the dial is set to turn street lights, for instance, off at 5:30 in the morning on the shortest day of the year, the increasing amount of daylight on

each succeeding day does not fool the mechanism. It simply adjusts itself each night to turn the lights on slightly later each evening and off a little earlier the next morning. When the maximum amount of daylight is reached on the longest day, in June, the switch reverses itself to cope with the diminishing periods of daylight. It is even designed to take care of varying twilight conditions in different parts of the world.

W. L. Porter

<sup>r</sup> Schenectady N.Y.

Copyrighted material

Christian Science  
Presented 10/2/31 205



## X-RAY PICTURES OF THE SINUS USED FOR IDENTIFICATION

X-ray pictures of the nasal sinuses, those tiny cavities in the skull which have caused discomfort and pain to many persons, provide a positive means of identification. No two sinuses are alike, Dr. Thomas A. Poole, of Washington, says, after close examination of 2,800 photographs of sinuses, collected over a period of eight years. Neither age nor treatment makes any difference in the sinus, so that an X-ray picture taken at any time in a person's life will be a lasting means of identification. Police and insurance companies are studying Doctor Poole's findings in the hope of adding the sinus photographs to fingerprint records for identification purposes.

22056

## LANDING GEAR OF PLANE LEADS IN STRUCTURAL FAILURES

Failures of landing gear cause the most accidents generally attributed to structural weakness in aircraft. All accidents, and their causes, for the last six months of 1930 were compiled by the department of commerce. In the structural-failure class, landing gear is held responsible for 77.2 per cent of all accidents, and the wings next, with 9.1 per cent. Heavy loads imposed on the gear by frequent rough landings probably caused most of the accidents, the report points out, stressing the need for landing-gear improvements.

Air Commerce Bulletin  
10/1/31 21999

## RUBBER PIPE POCKET IN BOOTS FOR ANGLERS AND HUNTERS

Hipboots intended for fishermen and hunters are being provided by one manufacturer with a rubber tobacco pocket that is waterproof and always within easy reach of the wearer. The pocket is fitted with a flap and is large enough to hold pipe, cigars, matches and a supply of tobacco.



Iswoodyear Rubber Co.  
116 Chambers  
New York



Patrons Must Be Identified at the Grilled Window  
Before They May Enter This Bank

## 'SPEAKEASY' BANK OPENS DOOR ONLY TO KNOWN PATRONS

Patrons of a bank in Illinois must identify themselves before the cashier unlocks the doors by pressing an electric button. Two robberies brought a decision by the directors to keep the bank doors locked until known patrons presented themselves. Strangers must present themselves for the cashier's scrutiny at a barred window before the door is opened.

## SHEET ZINC MADE FOR BENDING HELPS METAL WORKERS

Sheet zinc, prepared so that it bends freely in metal-working processes, is now on the market. Previously, this metal could not be put through a press nor did it have sufficient free bending to allow it to be worked to any great advantage. The new type of zinc can be bent, seamed and formed both with the grain and across the grain, without fear of cracking. Its surface is very smooth, making this material valuable in metal working.

Chicago.  
205 W. Wacker  
New Jersey Zinc Co.  
160 Grand St.  
New York



a 200 3

rec April 1930 578  
Feb 1928 67



# Your idea

Here's an Opportunity for  
Everyone to Help Supply  
Simple Time, Labor and  
Money-Saving Things for  
Which the Entire World  
is Waiting . . . . .



**What's**  
ELECTRICITY - describe how  
AVIATION - describe how  
RADIO - describe how  
CHEMISTRY - describe how  
HEATING - describe how

**Wanted**  
TELEVISION - describe how  
MECHANICS - describe how  
HOME APPLIANCES - describe how  
LABORATORY - describe how  
AUTOMOBILE - describe how

"WHAT the world needs is something new because wealth depends not on capital—we have too much gold—or labor, but on ideas," recently declared one of America's greatest engineers.

"A new prosperity is ahead of us. New fortunes will be made, new leaders will find the way to the top. The rewards are greater than ever before in history, but they will not be for those who merely wait for something to happen. The rewards will go to the man who has ideas and who puts them into use."

History of the past gives us the key to the future. Take a look backward. Just a hundred years ago, America was cheering its first passenger train. Its average speed was fifteen miles an hour. In the same year Michael Faraday discovered the principle of electromagnetic induction without which the present development of the electric industry would have been impossible—no electric lights, no telephone or telegraph and no radio.

Within the memory of men, automobiles have supplanted bicycles, rayon is competing with silk, the aluminum industry was born in the experiments of a youth in college, radio has girdled the



Cooking Steak Right on Table So Easy with Apparatus Shown Above

Ind. Sir Wilfrid Stokes  
(wrote several million times)



List of 195 needed inventions  
 price 1 shilling. post 2 pence. a 2003

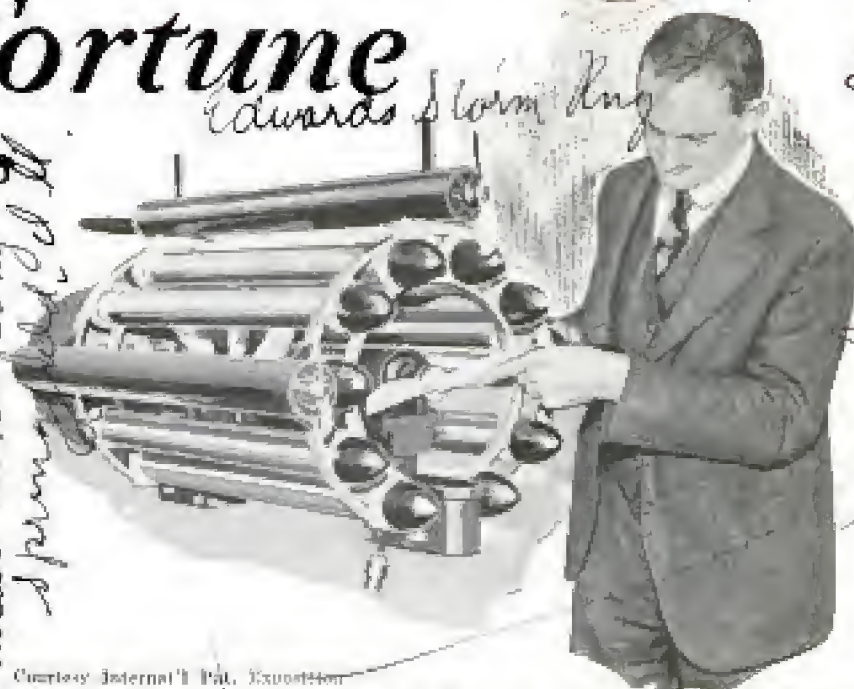


# may be worth a Fortune

globe, airplanes have become commonplace, new motors have been developed, lacquers made from explosives have revolutionized the paint industry and American talkies are seen around the world.

Each development has created new wealth and opportunities for everybody, particularly for simple ideas. One man puts a bit of rope about a paper bag for shoppers and reaps a fortune. Another prints a face on a thin bit of rubber and immediately sells it to a great corporation for advertising purposes. The first automobiles had a rubber bulb for a horn. Another inventor came along with a better horn and made millions. There is no end to opportunity, no limit to the wealth which may actually be created by ideas. The entire world is crying for new ways of doing simple things.

Engineers agree that the chances for inventors to convert original ideas into dollars were never better than they are today. An inventor, for example, who can devise a really safe and effective automatic railroad coupling to lessen the yearly toll of life and limb, will make a fortune if, before the end of this year, he submits a winning idea to the International Labor Office at Geneva, Switzerland.



Courtesy International Pat. Exposition

Model of "Barrel" Type Airship That Operates on Compressed Air; It Has Three Motors and Cylinders Are Made of Rubber

land, or to the International Railroad Union. It is estimated that, in Europe alone, about two billion dollars will have to be spent in re-equipping rolling stock with effective automatic couplings.

Every year, the Institute of Patentees in London files details of 40,000 new inventions. Even some apparently unlikely inventions, of which the patents were filed in 1930-1931, are today returning royalties to inventors whose chances of success seemed far from rose-colored.

"It is never safe to say that a particular invention will never make money for the inventor," said Capt. G. Drury Coleman, secretary of the institute.

"I once said that the man who invented the glass ball in mineral-water bottles made \$15,000,000. He angrily wrote to

International Bureau of  
 Railways, 24 rue de la  
 Paix, Paris, 16, France

39, Victoria Street, London, England

Richardson Marshall, Chicago, Managing Director  
 B. H. Edison, New York  
 French and German

Patent Law Office, New York, April 1933

Edwards & Stern, Inc.

Edwards & Stern, Inc.

Copyrighted material



and of patent list of wanted inventions  
 appear in monthly publications  
 POPULAR MECHANICS  
 "The inventor" published by Institute  
 are permanently fixed hatpins. House-  
 wives now have available a geyser kettle  
 which produces immediate and contin-  
 uous supplies of hot water; there is a spoon  
 which cannot fall into a boiling saucepan,  
 owing to a catch at the top of the handle.  
 Do you know that the man who invented  
 the movable top of collar studs has drawn  
 royalties of \$20,000 a year from this in-  
 vention, and has been receiving that mon-  
 ey for a long time? Often, even appar-  
 ently strange and ridiculous ideas in me-  
 chanical devices find a good market."

Chicago  
 One copy inventory 2003  
 B.E. Blakely  
 107 S. B. St.  
 Norwich, N.Y.

another  
 copy and  
 Blakely  
 Filadelfia  
 Pa. N.Y.

me that he had not  
 made nearly so  
 much money. Still  
 the invention  
 brought him a for-  
 tune. At one of our  
 exhibitions for in-  
 ventors, there was  
 a device for forcing  
 toothpaste out of a  
 tube by means of a  
 handle, and, frank-  
 ly, I thought peo-  
 ple would always  
 prefer to squeeze a  
 tube. But, one day, a firm which makes  
 polish, rang me up to say: 'We are hav-  
 ing great difficulty in making our polish  
 exude freely, can you suggest something?'  
 Here was the chance for the handle in-  
 ventor. A device that was not attractive  
 as a toothpaste novelty was sold to meet  
 a practical need.

"Out of the 40,000 new inventions re-  
 cently filed, it is surprising how people  
 who would not usually be supposed to  
 possess mechanical inventive abilities  
 have developed profitable ideas. If the  
 fashion of long hair comes in again, there

A feature of the Institute of Patentees  
 is the "Wanted Book." A few years back,  
 Sir William Bull presented the Wanted  
 Book to the institute. His idea was that  
 it should form an exchange between man-  
 ufacturers and inventors, and in it was  
 entered every conceivable type of inven-  
 tion proposed by inventors or inquired  
 for by manufactur-  
 ers and business  
 men. A difficulty  
 which has had to  
 be overcome was  
 that many of the  
 things suggested  
 proved in practice  
 to be too costly to  
 produce, so the slo-  
 gan of the inventor  
 must be, "Try to



© Special Press



Courtesy H. C. Johnson  
 Girl Inventor with "Non-Skid" Soap, at Top; Center,  
 Midget Phonograph That Plays Full-Size Disks, Yet  
 Can Be Folded into a Vanity Case; at Seat Adjust-  
 able for Width, Below

Chas. H. C. Johnson  
 "Screen House" Doctors  
 Park, Harrow, England  
 46 Johnson Club Co. 132 Northfield Road, Kensington, London, W.8  
 "Running Room" Eng



keep the cost down to rock bottom." In the Wanted Book, at the moment, a firm offers a prize for "a metal container to hold loose face powder. The container should be quite slim and convenient to handle, and easily slipped into a woman's vanity bag. The device must also have a fairly large surface area. The utility of the new box will be enhanced if it is made to hold a specially designed refill, thus binding the buyer to use a particular type of powder." Here are some other popular requests sent, in the last few weeks, by manufacturers and recorded in the Wanted file room of the Institute of Patenteers:

Wanted a collapsible table for wringing machines, making a complete table and needing only one movement for conversion; cardboard boxes collapsing when not in use; method of making stainless iron from chilled iron, which will withstand heavy loads; needle or hook automatically operated for the purpose of reknitting runs or ladders in knitted fabrics, or silk hosiery (the



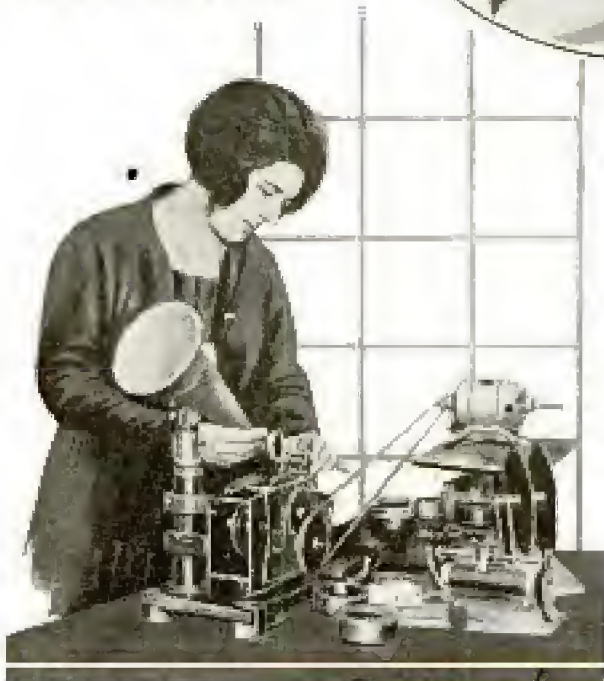
London Daily Mail

Model of Safety Lock for Mine-Shaft Elevators, Top: Bottle with Lop-Sided Neck to Prevent Gurgling or Spilling, Center: and Phonograph That Plays from Film



firm asking for this hook knows that there are already patented needles or hooks on the market, but wants a patented device of its own); lipstick

case, used with one hand only; method of burning kerosene without use of wick; a simple automatic trailer brake applied when trailers overrun power unit; improved wax-composition cork stopper for bottles (the stopper must be bright in color and strong enough to be driven into bottles without fracturing); automatic floor-polisher machine, needing no power and having no wheels to clog; a device to quicken production of dentures not made of gold or vulcanite; an idea for a firm making flat and other forms of tubing, which wants a novel and profitable line for its goods; a means of keeping ground coffee as fresh as when it comes from the grinding machine (either by packing or treating the coffee); a fireproof gasoline tank; boot and shoe fasteners on eyelet



Courtesy Miss. Pauson Johnson

Paris, France



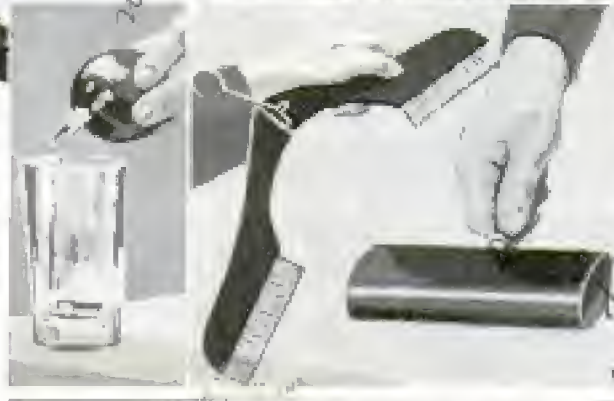
J. L. Andrews  
37 Cranford Road,  
Darneston Ind. Chelmsford  
England  
A 2003



system but incorporating well-known strip fastening; machine converting battens and deals into thin boards without waste of lumber; smokeless electrical lighters; anti-freezing solution for autos; a sink strainer which does

not leave refuse on the base of the sink; a cheap clip-on apron, needing no tying strings, and which can be sold at a low price; a cheap electric heater; a road surface safer for motoring and horse traffic; electric-cable cover which will not burn; sewing machine whose shuttle does not run out and stop the machine; a simple device to prevent the corners of rugs curling upward; a floor stain sinking one-eighth of an inch into deal boards.

The records of the Institute of Patenteers reveal strange contrasts between the trade or profession of the inventor and his or her creation. An accountant recently invented a new way of preserving eggs; a plowman invented a new type of rotary engine; a naval lieutenant produced a new parlor game; a woman devised a mechanical scarecrow for corn fields and orchards; an author invented a new phonograph disk playing ten times



Courtesy London Daily Mail  
Scissors with Spring Tilt Takes Up Wear; Baby Carriage Driven by Engine; Lemon Squeezer That Leaves the Pips; Combined Clothes Hanger and Brush, and Crumb Sweeper

as long as the ordinary disk; a surveyor has a new dishwasher; a woman, a new parachute; a physician, a new tool for cleaning fish; and the inventor of the deadly wartime trench mortar turned his hand, just before his death, to the production of a novel

electric table cooker, in the form of a frying pan cooking by radiant heat, which is placed over the plate off which the food is to be eaten. Another recent invention is a bottle which does not gurgle, froth or overflow when liquid is poured into a glass.

But the most extraordinary story of a recent invention is told of a man of twenty-four years who is working in a secret laboratory on a heath a few miles outside London. After three or four years of experiments, he has invented a chemical "dope" which, when applied to a helmet or suit, enables the wearer to walk in perfect safety in the face of intense heat or a raging fire. Emissaries of foreign governments are alleged to have tried to steal his invention. Foreign war departments are said to be interested in this invention since it can be applied to making airplanes fireproof.



*2 Mr. Vail, 6150 Estate Drive  
Oakland Calif. in charge of work*

*at Salinas Calif* 1958 *Hendley Eversole,*  
POPULAR MECHANICS 925 *newman's*

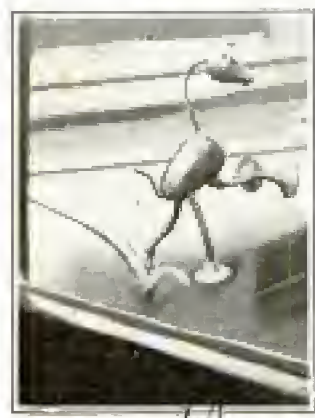
**MEAL MADE OF CULL LETTUCE  
USED TO FEED STOCK** *44*

Cull lettuce, a packing-shed waste which accumulates by the ton and has been a costly problem to packers for years, is being transformed into an alfalfa meal which is good for feeding live stock. The waste lettuce is run through a chopper and crusher, a large percentage of the water is squeezed out and the resulting product is treated with heated air. It resembles alfalfa meal both in appearance and food value. The reduction plant, making disposal of the cull lettuce easy, plans a flume system of transportation for floating the lettuce from the packing sheds to a settling pond, thus eliminating the use of trucks. Shippers now deliver the lettuce free, because the hauling distance is shorter.

*1962*

**TOYS WITH VACUUM HANDS  
CLING TO GLASS**

Gay-colored toy figures with vacuum-cup feet and hands are among the newest amusement devices for children. They also can be used for ornamenting automobile windshields and windows, holding merchandise in windows or showcases, and for attaching signs to the glass of shop windows. The toys consist of a wooden body, a head mounted on rubber



*60¢*

tubing having a copper-wire core, and hands and feet consisting of rubber suction cups with a copper-cored stem. The copper allows the parts to be adjusted in any position, yet provides sufficient stiffness. Several of the figures can be arranged in a group, the feet and hands adhering to each other.

**RIM JACK IS SO EASY TO USE  
CHILD CAN OPERATE IT**

Operated while standing in an upright position and without soiling the hands or clothing, a rim jack for automobiles is be-



*patent*

Rim Jack for Auto That Can Be Operated from a Standing Position without Soiling Hands

ing made to replace the old axle type. The jack is placed at an angle against the wheel rim and raised with a crank. With the car lifted, the tire can be slipped over the jack and a rim support shoved under the wheel to hold it while changes or repairs are being made. The jack folds into small space so it can be carried under a seat, and a child can operate it.

**APPLE BARREL WITHOUT BULGE  
OCCUPIES LESS SPACE** *1959*

Less storage space is required for a straight-sided apple or potato barrel which has the same capacity as the old-style container with bulging sides. The barrel, just placed on the market, is constructed of three-ply hardwood veneer and weighs less than the stave barrel. Its makers also claim that it is more moisture-proof.



*Otto Ketselsen  
Kenmore Blvd at 18th St. W.  
Minn. Ohio*

*The Northern Plywood  
Co. Houlton  
Maine*  
Copyrighted material



Nelson Plate Mfg Co  
2953 N. Albany Ave  
Chicago

Thurs. of California  
Los Angeles  
Calif

926

POPULAR MECHANICS

Q 2000



Bullet-Proof Heart Guard for Policemen: It Is a Disk of Steel and Weighs Only Seven Ounces

### HEART GUARDS FOR POLICEMEN ARE BULLET-PROOF

Chicago policemen are being provided with bullet-proof heart guards in the form of steel disks, weighing only seven ounces and beveled to fit the body directly over the heart. This lightweight form of protection has been found more practical for officers on active duty than the bullet-proof vest, which weighs seven pounds or more.

*Copied from Products of the month*

### COIN METER ON REFRIGERATOR COLLECTS OR CUTS IT OFF

Payments on the electric refrigerator are collected or the service stopped by a coin meter now on the market. The meter is connected to the house current and the refrigerating unit so that a daily deposit of twenty-five cents will give twenty-four hours of electric service and ice. As many as eleven quarters may be placed in the meter at one time, but after the eleventh day the service is interrupted unless another quarter is deposited. Money placed in the meter pays only for the refrigerator.

Q 2007  
made by General Electric Co.  
for military use  
Los Angeles, Calif.  
Sears & Roebuck  
Chicago, Ill.

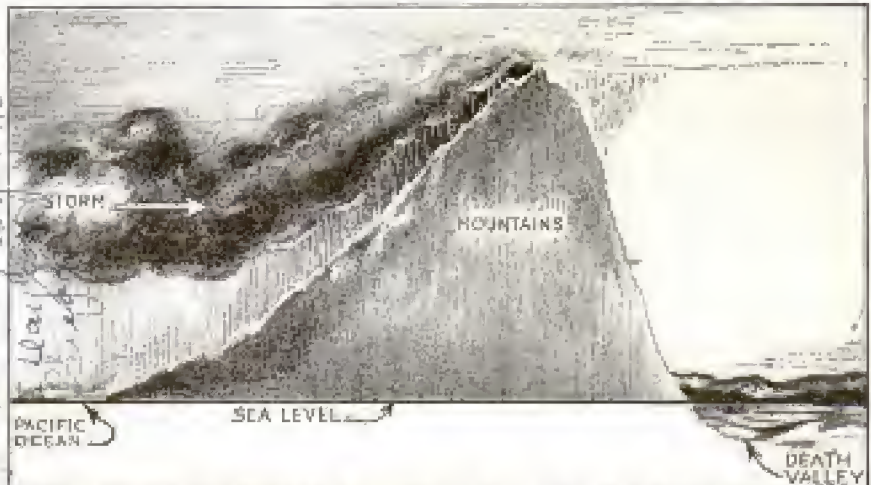
Meter also  
taken over by  
Frigidair  
11/5/32

### WATER MOLECULES IN CLUMPS HEAT-RAY TEST SHOWS

That liquid water molecules form in clumps of two or more has been discovered by Prof. Joseph W. Ellis in tests with infra-red, or heat, rays. As the rays are absorbed by water, certain new bands or dark patches are observed in the infra-red spectrum, supporting the theory that the simple chemical units of two hydrogen and one oxygen molecules are probably linked in groups or even form a latticelike structure. This theory also has been given weight by phenomena observed during the formation of ice.

### CLOUDS SQUEEZED DRY IN RISE OVER MOUNTAIN TOPS

Clouds are squeezed almost dry of their moisture as they rise, each 1,000 feet of altitude increasing the annual rainfall at a rate of slightly more than six inches. This fact has been learned through observation at three points in California. At Squirrel Inn, San Bernardino county, at an altitude of one mile, 16.71 inches of rain fell in twenty-four hours. At another point just thirty-seven feet lower, 11.51 inches of rain fell in one hour and twenty minutes. The twenty-four-hour record is the heaviest day's rainfall in the state's history. Bagdad, a small town with an elevation of only 784 feet, recorded no measurable rainfall for twenty-five consecutive months, although it was in the same county where the record was established. This shows how effectively the mountains squeeze out the moisture and leave little for the Death Valley area.



How Clouds Lose Moisture as They Rise above Mountains between the Pacific and Death Valley

Report of Hydrographer J. E.  
Southern California Weather Bureau  
Created from original material



# Fish and Animal Doctors Cure Ailing Pets



Above, Parrot in an Animal Hospital Ready for a Cleansing Spray Bath as Part of Course of Treatment



Hospitals for Animals, Birds and Fish Have Been Established in Many Parts of the World, and Specialists in Animal Injuries and Diseases Now Are Attached to Most Zoos; Above, Two Doctors Are Shown Treating a Dog for Concussion of the Brain, and, at the Left, a Goldfish Is Undergoing an Operation in a Fish Hospital at Toronto



Animals, like Man, Find Their Principal Enemies in Germs and an Ailing Lion or Tiger in a Zoo Undergoes a Thorough Physical Examination Before Its Trouble Is Diagnosed by the Animal Doctor; at Right, a Young Leopard Is Being X-Rayed to Determine the Cause of the Beast's Sudden Illness





A2015  
928

Rossia Educational Chart  
73 POPULAR MECHANICS  
New York

University  
of Buffalo  
Buffalo NY  
Prof. Frank J. Livingston  
and Dr. Gilbert Beck

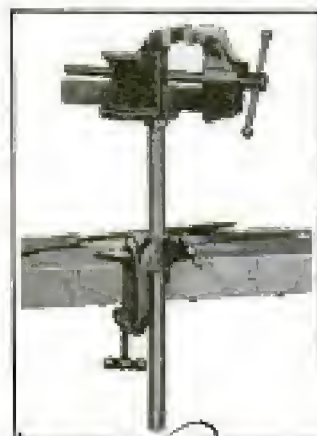


Information about Any of the Forty-Eight States is Shown on Chart Which Operates Mechanically

## MECHANICAL CHART OF NATION GIVES GEOGRAPHICAL FACTS

Geographical information about any of the forty-eight states in the United States may be obtained by operation of a revolving chart with a keyboard at the outer edge of the disk. Turning the keyboard to a certain state will cause the chart to show, in cut-out spaces, the largest city, the capital city, the state's rank in population, the area, principal industries, dates of settlement and entry into the union, and other facts.

## BENCH VISE MADE ADJUSTABLE TO HEIGHT OF WORK



Adjustable to the exact height of the operator's work, a bench vise which saves time has been placed on the market. Not only is the vise adjustable up or down, but it turns on a swivel, making many operations easier.

## NERVES TREATED WITH CORTIN GET TEMPORARY RELIEF

Temporary relief from nerve diseases has been obtained by using cortin, life-saving extract of the cortex of the adrenal glands, in test cases. In some cases, insomnia was replaced by restful sleep, depression by a sense of well-being, fatigue was reduced and aches and pains diminished or disappeared. But cortin is in no sense a cure for such conditions; the experimenting doctors warn, the tests showing that only temporary relief follows treatment with the extract, which has prolonged life in patients suffering from once fatal Addison's disease.

## ONE-WAY RADIATOR AIR VALVE SAVES FUEL IN HEATING

Allowing air to pass out of a radiator, but preventing any from entering, a vacuum cap that fits any ordinary steam-radiator air valve gives the valve a vacuum action, enabling the radiator to furnish more heat on less fuel. Radiators are hot only when full of steam and the one-way valve cap assures a steam supply because, as that in the radiator condenses, more is drawn from the boiler to fill the partial vacuum. In this manner, radiators are kept hot for hours without forcing the fire to raise the pressure.



## TRACTOR WITH RADIO CONTROL PLOWS BIG FIELD

Entirely controlled by radio, a tractor recently passed a successful test while plowing a thirty-acre field. The tractor carried three fourteen-inch plows with a keyboard operated from an automobile thirty feet behind. The tractor was started with one key, the clutch adjusted with another, the machine guided with a third and the engine's speed by a fourth.

Wm A Barrett Co,  
126 N. Clinton, Chicago

Deposited by  
J. J. Lynch, Miles City  
Mont., at  
Copyrighted material



A 1911. Cont. John Stewart MacClary  
725 W. 14th St  
Oreola, Cal 929

POPULAR MECHANICS

# Grooved Tires Help Win Pikes Peak Race



Taking a Hairpin Turn at High Speed in a Race to the Summit of Pikes Peak; Inset Shows Grooved Auto Tire Used by One of Racers to Minimize Slipping in Loose Gravel

With the present perfection of cars and the skill of their drivers, the outcome of an automobile race often turns on some trifle—the result of keen observation or lightning-quick decision. This was true in the last Pikes Peak race to the “top-o’-the-world.” The winner was C. A. “Chuck” Myers, who drove a Hunt Special (Studebaker “President Eight”). His time was seventeen minutes, ten and three-tenths seconds. Slightly more than fifteen seconds slower was the time of Glen Shultz, who drove a car powered by

a DV thirty-two-valve Stutz motor. The road surface of disintegrated granite affords poor traction—especially on sharp curves taken at high speed. The winning car, and that which placed second, used tires whose heavy treads had been remodeled. The winner had deep grooves cut across the treads, while Shultz’ tires, too, were specially grooved, but on them the grooves followed the circumference. The effect was very much the same as obtained by putting cleats on tractor wheels. Slippage was thus minimized.

## MERCURY-METAL VAPOR LAMP CONNECTS TO ANY SOCKET

Mercury and metal vapors have been successfully mixed to produce a light of any color in an electric lamp which can be connected directly to any socket. The lamp combines the advantages of the mercury-vapor arc and the neon tube. It can be made in the form of the usual long tube or a very short tube curved back on itself to produce a U-shaped bulb which

can be screwed into any household socket, something not possible before. A light very similar to daylight is produced by mixing vapors of mercury, zinc and sodium at high pressures, while other mixtures will result in lights of various colors. This lamp glows almost immediately after the current is switched on, and after about one minute, the light intensity increases to a maximum. It is about three times as efficient as the best filament electric lamp of equal candlepower.

and St. S. S. S. S. S.  
Berlin No. 4. Chaussee 117.  
Germany

181 E. 142nd St  
New York City, N.Y.

Aerandson & H. Kornia, Esq. 11-14, Chaussee 117, Berlin, Germany

in connection with H. W. Stevering of Germany  
and Dr. Edmund Bermer



# EARTHQUAKES



© Fairchild Aerial Survey, Inc.

gineering at Stanford University, California.

These men produce quakes and control them. With skillfully designed apparatus, they determine in advance the kind of shock they will have, fix its character, intensity and duration. To these known conditions of destruction they oppose the resistance of accurately constructed models of buildings. They then as-

**R**EDUCTION of loss of life in earthquake disasters to great cities, such as the destruction of San Francisco in 1906 and of Tokio in 1923, is sought in experiments with man-made shocks and models on a huge "shaking table" in the school of en-



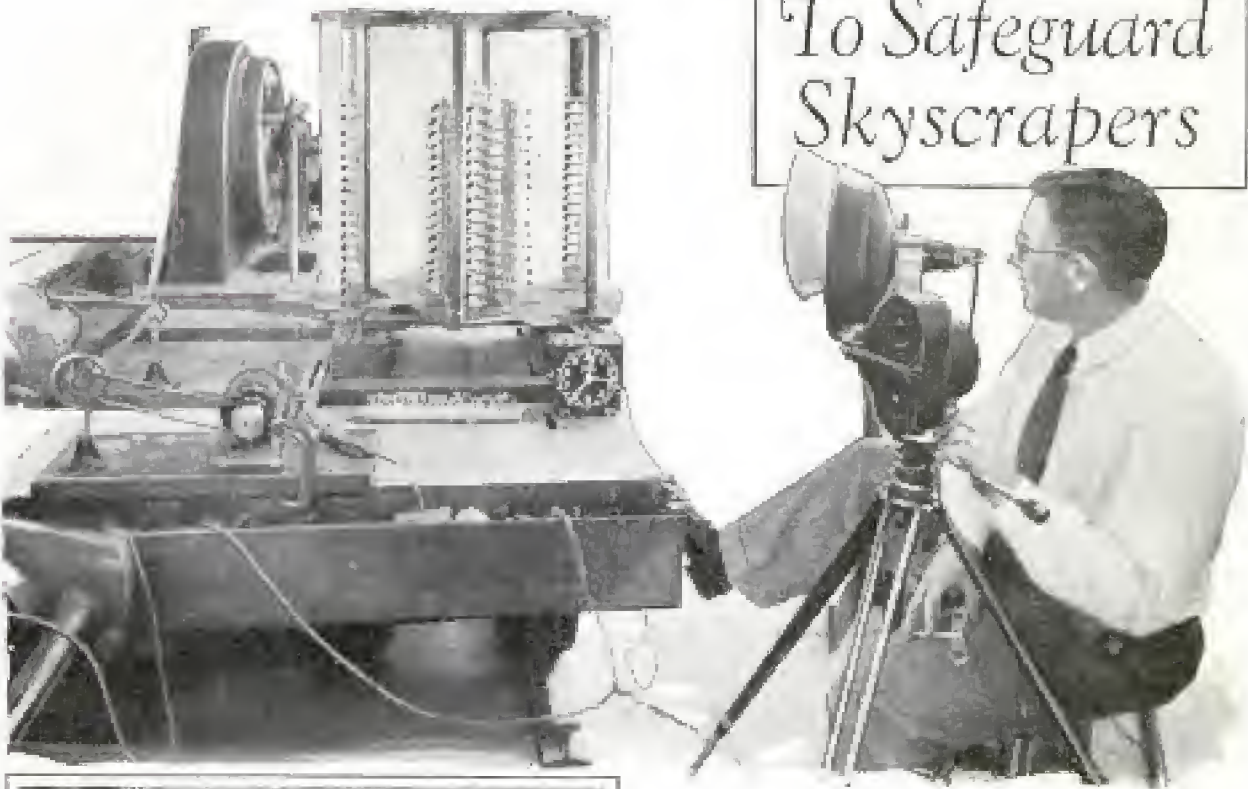
Lower Manhattan Island, Top; Toppling Chimneys with Man-Made Quakes, at Left, and the Earthquake Machine

certain exactly how and why the structure failed. And thus knowing the conditions of destruction, they proceed to



# Made to Order

To Safeguard  
Skyscrapers



Photos © Planet News, Ltd.  
Making Movies of Model Building in Earthquake Machine; Eleven-Hundred-Pound Pendulum Hammer

work out the principles of safe construction.

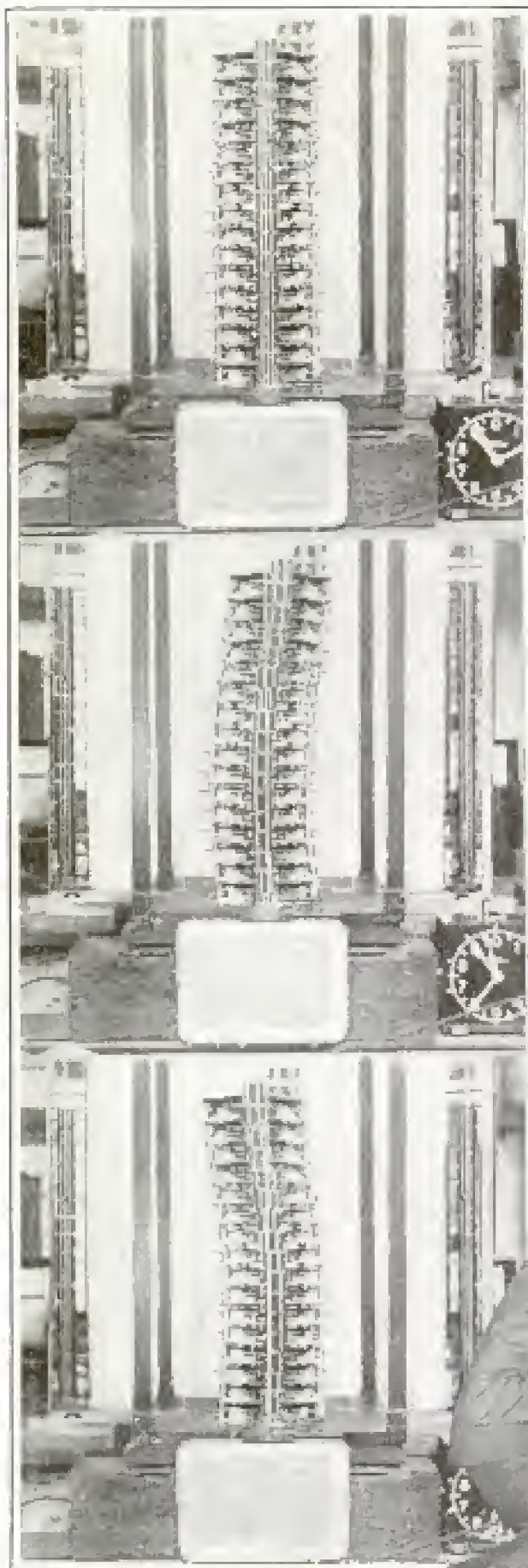
Already they have taken the first few steps in their efforts to learn best methods of building quake-proof structures, humble homes or tall towers, and how best to build on loose ground and how on

rock. Their experiments indicate that diagonal sheathing in a wall is apt to be more resisting than horizontal or vertical sheathing. They have found that nails are easily shaken loose. They have learned that apparently weight, and not surface exposure to the wind, determines the susceptibility of an engineering structure to earthquakes.

Prof. Lydik S. Jacobsen, of the department of mechanical engineering, is the scientist conducting this research. For one of his experiments upon the shaking table, a 6,000-pound platform mounted on four car wheels, he places a mathematically exact model of a building. An 1,100-pound pendulum, seventeen feet long, is raised to a certain height and—whang—it crashes down into a bumper spring fastened to the vibrating platform. Before the pendulum can recoil for a second blow, it is caught. The pendulum has struck a blow the force of an earthquake, and observers are able to determine the exact effect which a comparable quake would have had on the life-size structure.

For another experiment Professor Ja-





cobsen prepared an unbalanced flywheel so that, when it rotated and caused the table to shake, the vibration would be a simple harmonic motion which could be varied to suit the needs of the experiments.

Since the vertical motions a building experiences during an earthquake are negligible compared with the horizontal, steel balls were placed between the floors to support the vertical load, and highly accurate springs were used to check the horizontal movement.

This model was placed on the shaking table and exhaustive experiments were made with it. The table was struck with the pendulum. The table was shaken by movements of various cams so constructed that they would reproduce the vibrations of many actual and many theoretical quakes. One of these cams reproduces the east-west component of the Tokio earthquake in 1923.

Professor Jacobsen used a small motion-picture camera to photograph the action of the delicate model as it moved when the three-ton steel platform was made to tremble.

To get an idea of the dynamic effect of water against the face of a dam during an earthquake, experiments were carried on by filling large wooden tanks with water and then observing them going through tests on the shaking table.

Experiments with various types of soil having different water contents, to learn how best to build on certain kinds of ground, have not progressed far enough to justify general conclusions, excepting that the old guess that buildings are safer on firm foundation than on loose ground has been questioned considerably. Evidence tending to show that

Moving Pictures Showing, Top to Bottom, How Model Sixteen-Story Building Is Distorted in Vibrator, and, at Right, the Cams That Reproduce Famous Temblors of History

Photos © Planet News, Inc.



1946

this is not always true being revealed.

Prof. Emeritus Bailey Willis, who was the originator of this research and widely acclaimed in scientific circles as "dean of the science of seismology in America," said:

"These experiments with artificial earthquakes constitute a most important advance. Professor Nito, of Japan, showed us how to build rigid buildings to withstand earthquakes. These experiments will tell us when to build either rigid or flexible structures to resist earthquakes and by the most advanced methods of design. The study is to safeguard mankind against an ancient danger which is due largely to his ignorance of the nature of earthquakes and the practice of safe conditions."

### CLOGGED-UP DRAINS CLEARED BY FLEXIBLE ROD

By winding the flexible rod, with which clogged drain pipes are cleared, on a reel, one plumber has solved one of the industry's problems. The wheel of the reel, which is fifteen inches in diameter, is used as a crank, and the rod is fed into



Flexible Reel for Cleaning Drain Pipes Mounted on Wheel Which Serves as a Crank

the pipe a little at a time, and a length of pipe may be inserted between the reel and the plumbing connection, allowing the reel to be operated in a standing position away from cramped and crowded places. The reel is light, weighing but eighteen pounds while carrying a fifty-foot rod, and may be strapped about the operator's waist to leave both hands free.

Harley L. Young,  
1412 N. Main St.  
Mayton, Ohio



Team of Concrete Oxen Hitched to an Old Covered Wagon to Lend an Air of Realism to a Collection of Early American Antiques

### CONCRETE OX TEAM ADDS LIFE TO ANTIQUE EXHIBIT

To add realism to an exhibit of early American antiques, a private collector in Michigan has constructed a life-size team of oxen of concrete, modeled on wooden frames. The team is hitched to an old-time covered wagon which is a part of the collection. The neck yoke is a genuine antique also, and the animals are painted in a manner to make them most realistic at a distance. The horns are from real oxen, the ears are made of parts of rubber tires and the tails are of hemp rope. The team and wagon stand beside a log cabin containing a collection of household utensils and tools used a century ago.

### INDICATOR SHOWS BOAT SPEED ON UNIFORM DIAL

Adaptation of a uniform dial to a speed indicator for boats has been accomplished in an instrument just placed on the market. The dial reads in miles per hour. From the indicator, which may be placed anywhere desired on the boat, a small rubber tube is run to the stern fitting. From there, a small tube, with a small mouth or hole opening forward, extends into the water. When the boat is under way, the pressure of the water at this mouth corresponds to the boat's speed, and is transmitted up the tubing, moving the hand on the indicators.

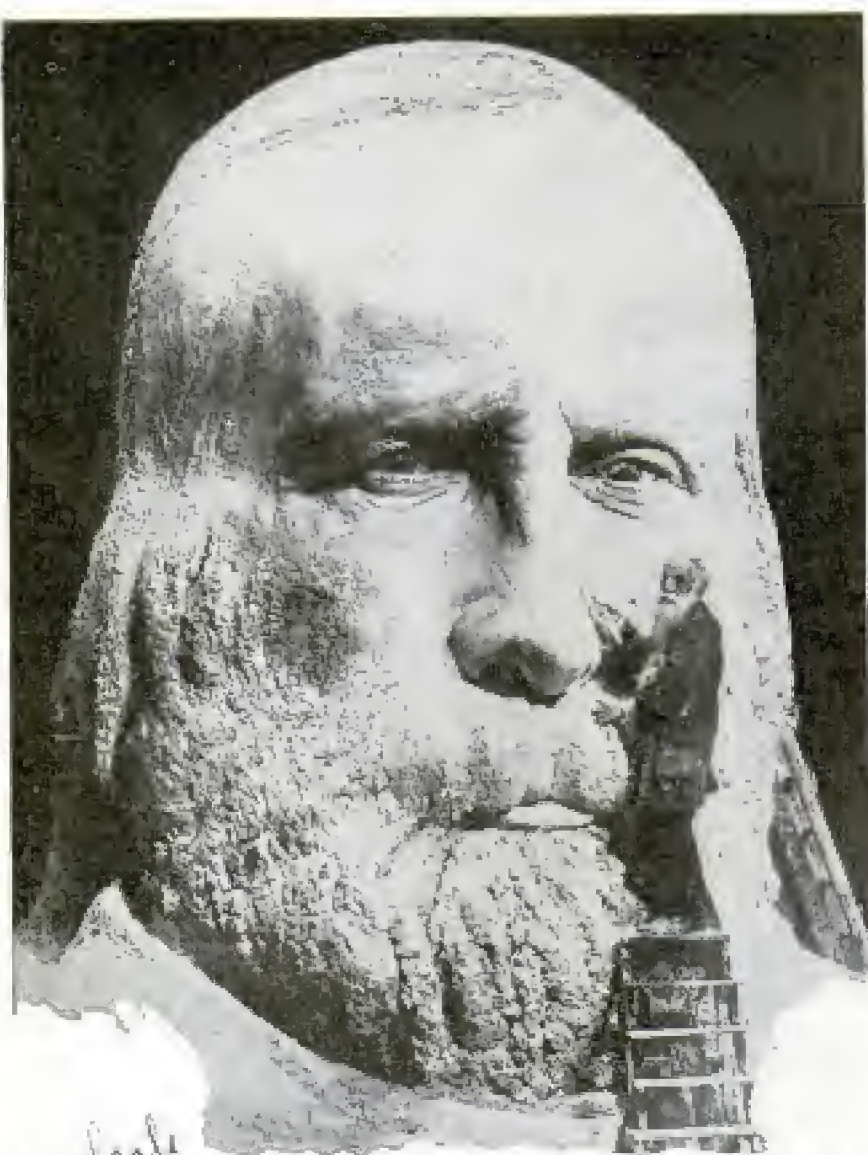
Constant Clarence Works  
4982 N. Kolmar Ave.  
Jefferson Sta. Chicago

Postcard  
300  
off  
month

Henry de Pau near  
Ypsilanti Mich

no  
500  
/ Kolmar





Sculptor at Work on the Huge Head of an Enormous Statue of Garibaldi, Famous Italian Patriot, Which Is Being Erected in Rome

### MAN'S HEAD LARGER AS A HOUSE IS CARVED IN STONE

In memory of Giuseppe Garibaldi, famous Italian patriot who died in 1882, a huge statue of the liberator and unifier of his country is being erected in Rome. The immense proportions of the stone likeness of the Italian were made apparent when a picture of the head was taken with the sculptor at work on it. This shows the head alone to be as large as an ordinary house, and the rest of the figure is in the same heroic proportions.

### MAGNETISM IS KILLED BY HEAT UPSETTING ARMY OF ATOMS

Iron atoms are like well-drilled soldiers, obeying their commanding officer—magnetic field—until their ranks are invaded by

atoms of other elements. This is what happens, says Tregve D. Yensen, of the Westinghouse Electric and Manufacturing company when iron, nickel, cobalt and their alloys are heated to certain temperatures. Heat destroys magnetism by upsetting the army of atoms until their fighting strength is reduced to zero. Mr. Yensen, inventor of a supermagnetic alloy, hipernik, points out that by alloying iron with various percentages of nickel, the temperature at which magnetism is lost can be regulated. Thus, hipernik, an alloy of equal amounts of iron, which loses magnetism at 760 degrees Centigrade, and nickel, non-magnetic at 375 degrees, will hold its magnetism to 500 degrees. By alloying iron or nickel with cobalt, which resists heat even more, the magnetic force continues to 1,140 degrees. Electric switches, made of an alloy in ac-

curate proportions, may be opened automatically when the temperature of a magnetic material reaches a certain point and closed when the temperature drops below that same point.

### "ELECTRIC EYE" SORTS BOXES ON CONVEYOR BELT

Color-operated conveyor systems recently have come into use, which shunt packages of different colors to different locations. The system depends on an electric eye, picking out packages of one color and operating a mechanism which separates these particular packages from others. The system can be used to discharge boxes according to their colors at various floors that are served by a vertical elevator.

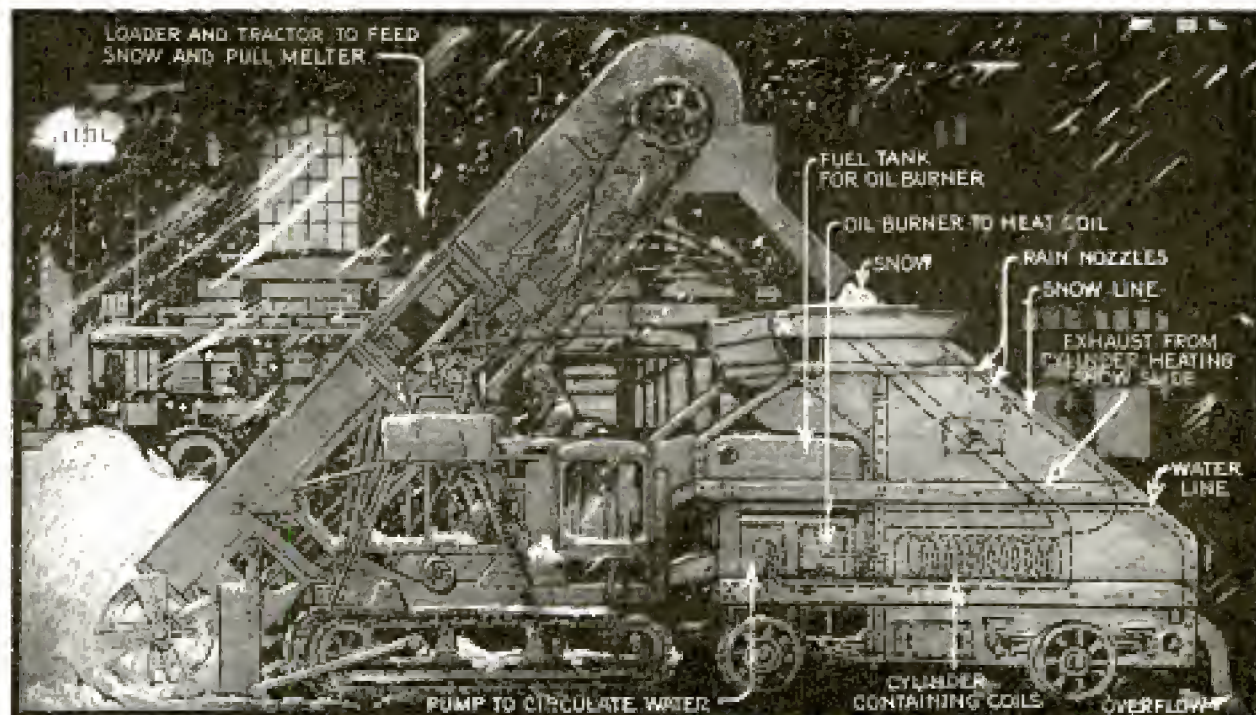
The Logan Co. 1115 Franklin  
Louisville Ky  
Copyrighted material

michele La Spina

a189



# Rain Machine Melts Snow to Clean Streets



Rain Machine Pulled by a Snow Loader That Will Clean a Half Mile of City Street Forty Feet Wide in an Hour; Photo Shows Method of Operation

Rain has been found to be the most efficient remover of snow, so an artificial rain maker has been devised, which, pulled behind a loader snowplow, will clean a half mile of forty-foot street in an hour. The machine consists essentially of a large tank of water, circulated through tubes which are heated by oil flame. Snow is fed from the loader onto a slide where the heated water falls upon it. The melted snow then falls as water back into the tank where an overflow pipe carries off the excess to the gutter. Clogging of the chute is prevented by the passage of exhaust gases from the heater under the snow slide.

a 1992

## COOLING AND HEATING SYSTEM COMBINED IN ONE UNIT

One California office building is heated in winter by the same refrigeration system that provides cool air in summer. As in an ordinary cooling plant, the refrigerant is vaporized by absorbing heat from a container of water, which it cools. When it condenses, it heats up the water of a second container. Air is passed over the cooled water to make the building comfortable in summer, but in winter the

water from the condenser is circulated through a tubular device which raises the building's air supply to a temperature of eighty degrees Fahrenheit. Towers on the roof force a draft which gives the water in the two containers temperatures from which the refrigeration system can operate.

## HAMMER FEEDS ITSELF TACKS FOR FAST AND SAFE WORK



Holding tacks or staples in your mouth or hand is eliminated by a self-feeding hammer now on the market. The magazine automatically feeds up tack or staple and a single blow drives it home. The operator can tack as fast as he can

swing his arm. Light roofing, upholstering and floor covering are some of the jobs on which a hammer of this type saves time and labor.

Bostitch Sales Co.  
East Greenwich  
R.I.

Scano Serno Builders  
9/26/36

not in commercial production  
until fall of 1932

Chicago  
642 S. Dearborn





Motorcycle Transformed into Small Auto by Mounting Special Body on It; Note Brace to Keep Vehicle Upright When It Stops

### ONE-MAN CAR BODY IS BUILT ON A MOTORCYCLE

Shaped like a baby car, a body of his own design has been built on a motorcycle by Sir A. V. Roe, British aircraft designer, for driving to and from work. Even a windshield is provided for the vehicle, which looks far more comfortable than the usual motorcycle. A small brace, operated by a lever, is let down to keep the car from falling when its driver stops.

### WAY TO BLOCK RADIO STATIC IN CODE RECEIVER FOUND

Static, the problem of radio engineers for years, appears to have been vanquished in code and radio printing-machine work at least, through the system evolved by a young Canadian engineer. Its possibilities from the broadcast standpoint have not as yet been fully developed, but give great promise. Essentially, the system consists in the transmission of a carrier wave, on which are superimposed two other frequencies, such, for instance, as one of 3,000 cycles and one of 5,200. These result in a common note, or heterodyne, made when the telegraph key is depressed. When the signal is received at the other end, the detector output is divided and sent through two filters, one passing 3,000 cycles and the other 5,200 only. At the filter output is

a tube arrangement that will pass on only such impulses that are perfectly matched in both sides of the filter. If static tries to come through, it will be stronger on one side or the other and so will never get by, and the reception will be free from static disturbances.

### FLOWER GROWTH IS SHOWN BY X-RAY

Details of flower growth and construction, including the appearance of buds, petals, leaves and stems, are brought out clearly by X-ray pictures of the blooming plants. Curiously, the charm of a flower is not lost by submitting it to the X-ray; on the contrary, the radiograph appears to enhance the delicacy of anatomy and beauty of form and line. Such pictures are difficult to make because it requires only a minute quantity of X-ray energy to penetrate the petals, the amount being about one-hundredth of that needed to X-ray the human skull.



X-Ray Picture of a Calla Lily Which Shows Details of the Flower's Growth and Anatomy

Alfred Starr

% Institute of Radio Engineers  
23 W. 39 St. N.Y.C.

Made by Arthur W. Fuchs  
Josephine Kodak Co.  
Rochester, N.Y.

Ryde England  
 Choclear Avenue  
 Monitor 9/26/31  
 and 4 Englebrecht Way Monro

a1920

a1926

Copyrighted material



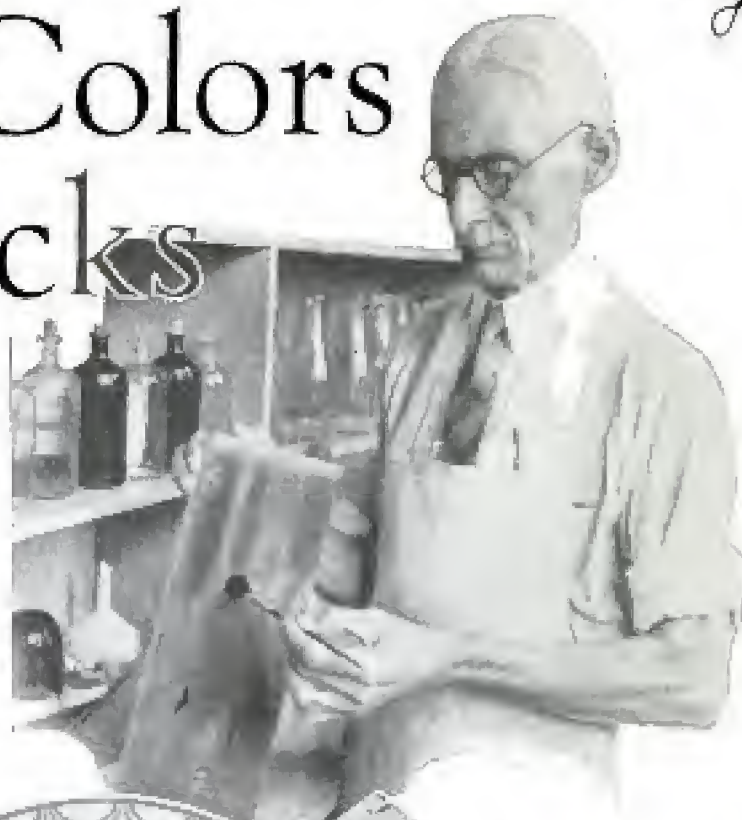
1188/

*George E. Ankerite and David  
(C. Warner, Glendale, Calif.)*

# Metal Colors from Rocks

FROM the ore dumps of southern California mines cast-off rocks are being converted without smelting into paint. Lead, bismuth, iron, zinc and other minerals form the basis of the liquid metal into which the rocks are converted. From this metal, paint in three forms—paste, solid and liquid—is being produced by two men who have been working quietly on the secret process for almost forty years.

They have succeeded in reducing low-grade complex ores into liquid metals and gases without the costly smelting process. No heat, other than brief contact with steam, enters into the process. As a result, they produce 276 colors for painting iron, steel,



ing with heat and cold, so do not chip off the glass.

Hard and heavy rocks are reduced to a liquid, light in both color and weight. The liquid, in fact, may be said to be a neutral color; yet, when it is combined with a gas, it is converted into one of the 276 colors.

"Here," said one of the developers of the process, pointing

to a stack of rocks, "are complex ores. We find in them the fundamentals of all colors. These ores, brought from the dump of a mine, are crushed, then run through a catalyzer which separates the precious from the base metals. It is the latter we use for color, after having processed them to a complex liquid."

He took down from the shelf a milk bottle partly filled with a waterlike fluid. Some of this he poured into a test tube. From another bottle came more liquid, this also waterlike and of the same consistency. The second, he explained, was a gas solution obtained during the process.



Painting with Metal, at Top, Ukulele "Antiqued" with Metal Paint, Center, and Light Globes Coated with "Rock" Finishes

wood, floor coverings, glass and other surfaces.

Electric-light globes around the stage of a Los Angeles theater are tinted with several colors of these paints, which have the property of expanding and contract-

*Ankerite Products Co.*

*1709 Standard Ave.  
Glendale, Calif.*



As he poured the liquids together, there settled to the bottom a beautiful chrome-

Machine That Grinds Pure Metals to Powder, Below, and Examining Complex Ore Before It Is Being Liquefied



yellow precipitate, which, he said, was pure metal color, composed of bismuth, lead, iron, zinc and other elements.

In the laboratory the ores first are broken up with a hammer. They then are crushed into coarse powder, and finally

pulverized as fine as flour. This is poured into a large digesting kettle, called a "catalyzer," together with a chemical which dissolves the minerals.

At last steam is turned into the kettle at a pressure of 125 pounds. While a rotary bar mixes the chemical and minerals, the steam aids in liberating gases which are pumped out. The residue is a solution of liquid metals. Here the binder has been removed, leaving pure, colorless metals. The only heat used in this process is the steam, and metals are removed from the original complex ore without smelting.

Exactly how the chemical reacts on the pulverized minerals is the secret. To produce any of the 276 colors the same colorless liquid metal is combined in different ways with the gases. "That the colors will 'grow' sounds unbelievable, yet here is the proof, a small jar containing a pure brown metallic color," said the demonstrator. "Two years ago we put two ounces of this material in the jar, and



A 1866

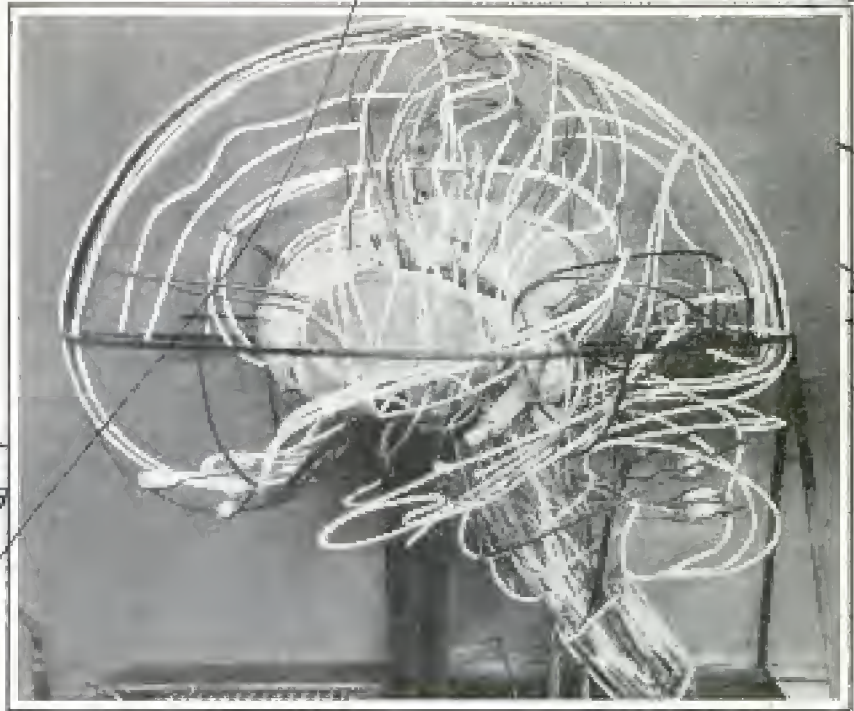
Mr. Edith Kleimperer

Mr. Robert Exner

today it weighs seven-  
teen ounces and is con-  
tinuing its growth. There  
has been practically no  
chemical change in it.  
Its bulk and weight have  
increased and its strength  
has increased in propor-  
tion to the weight. We  
feed it nothing to attain  
this growth, yet were we  
to feed it gases taken  
from it, we could force  
its growth materially.

**MODEL OF BRAIN  
MADE OF NEON  
TUBES**

Two Vienna physicians  
have made an illuminat-  
ed model of the human  
brain and central-nerve  
system out of 100 pieces of neon tube.  
The glass construction enables the show-  
ing of both interior and exterior parts,  
and in lecturing, the particular section



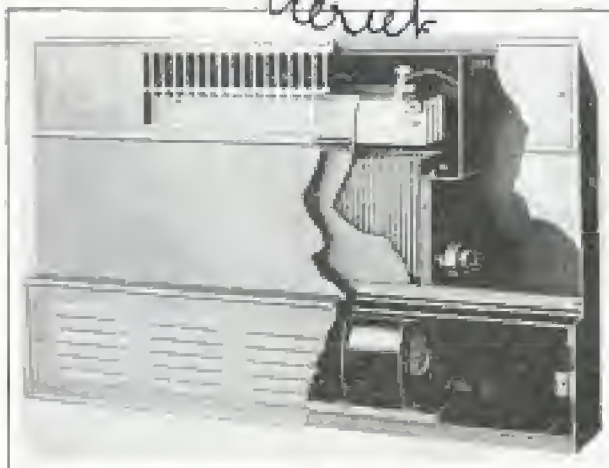
Illuminated Glass Model of the Human Brain and Central-Nerve System,  
Which Was Made Out of About 1,000 Pieces of Neon Tube

under discussion can be illuminated while  
the rest of the model remains dark, thus  
making it a simple matter to trace the  
functions of each area of the brain.

Model demonstrated at 8th Int. Congress  
International Neurological

**STEAM RADIATOR IS COMBINED  
WITH ELECTRIC HEATER**

Two types of heating elements, a steam  
radiator and an electric heater, are com-  
bined in one cabinet now being offered in  
two forms, one model fitting into the wall  
and the other representing the free-  
standing variety to replace cast-iron ra-  
diators. The electric and steam heaters  
can be operated together or separately as



Steam Radiator and Electric Heater in One Unit; a  
Motor-Driven Fan Is Included

desired, and motor fans in the cabinet can  
be used independently of either heating  
element to provide cool-air circulation in  
summer. An air-washing and humidify-  
ing attachment also is obtainable. The  
combination radiator is intended for use  
in bath or living rooms where it is desir-  
able to take the chill off in the fall or  
spring before the regular heating plant is  
in operation, or it can be used as an aux-  
iliary to the heating plant when the latter  
fails to furnish sufficient warmth. It is  
claimed the cost of operation of the elec-  
trical unit is lower than for the ordinary  
type of radiant electrical heater.

**LONG LIFE OF JEWEL BEARINGS**

Friction between the pivot and a jewel  
bearing has been measured to find why  
such bearings have long life. One of the  
discoveries is that rust is formed during  
rotation and is chiefly responsible for in-  
creased friction. Lubrication was found  
to prolong the life of the bearing al-  
though apparently it did not diminish the  
friction.

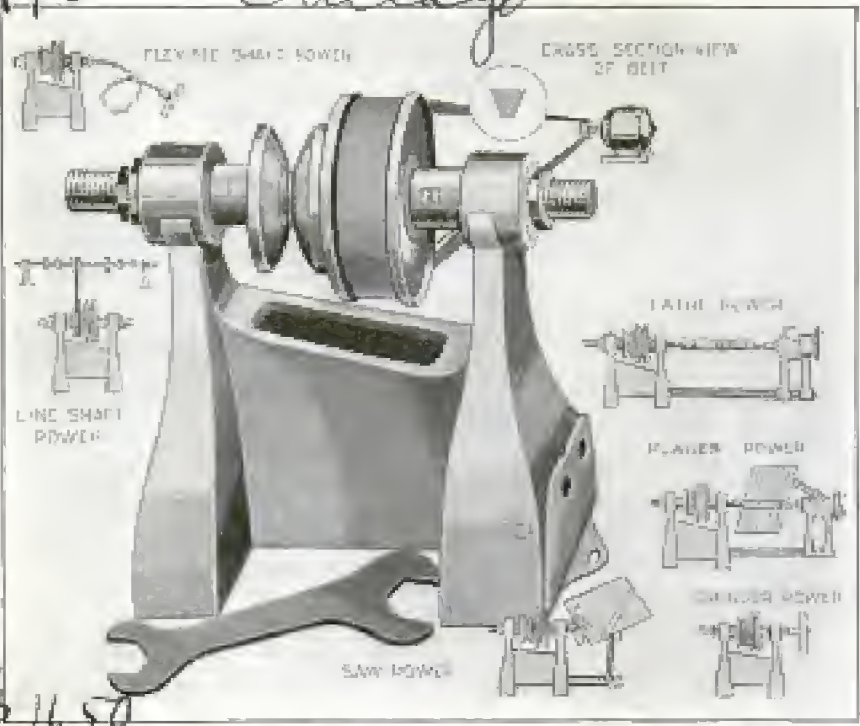
W. J. Timms  
10/4/31

W. J. Timms  
Way Electric Appliance  
Corp. 2101 Auburn Ave  
Toledo, Ohio

British National  
Physical Laboratory  
Copyrighted material



Waco Tool Works  
 5216 W. Kensington  
 Chicago  
 940  
 1990  
 POPULAR MECHANICS  
 Science Service  
 10/3/71



"Universal" Headstock That Provides Power for Almost Any Purpose in the Shop; It Has Been Named the "Thousand and One"

### THOUSAND AND ONE PURPOSES ACHIEVED BY SHOP TOOL

Equipped for driving with a non-slip V-belt, a new headstock for the craftsman's shop has been introduced under the model name "1001," descriptive of its many applications. It can be used in connection with any kind of motive power from one-fourth horsepower up, and is built with double heads with both ends of the shaft threaded. Standard thread-fittings and parts enable any variety of combinations. Openings in the base casting allow for the insertion of steel rods for attaching rigid lathe beds, or the mounting of a saw or planer table, and like implements. Among its manifold purposes are the provision of power for flexible shafts, lineshafts, lathes, planers, grinders, saws and polishers.

### AUTO UNDER BRIGHTEST LIGHTS FROM START TO FINISH

So brilliant must be the electric lamps under which automobile makers work that the motor car is fast becoming a creation of light. All the way from the foundry to the finished car, light of particular intensity and character plays a vital part in its production. In one large automobile factory, light intensities vary

from eight to 140-foot candles. Normal daylight is not sufficient. About 3,000 mercury-vapor lamps and 25,000 incandescent lamps have to be used. And then the finished product is placed in brightly lighted display rooms.

### 91972 GOLD SEPARATOR REQUIRES NO WATER

Intended for use particularly in desert regions where little water is available, a small gold-washing machine with a capacity of about one cubic yard of material an hour can be operated under certain conditions without any water. It consists of a screening and washing drum mounted above a concentrating pan which separates the gold and other heavier materials and places them in a pocket at the rear of the pan. The machine, which can be taken down easily and transported anywhere, requires little water to operate at any time, and tests have shown that it will run at almost maximum efficiency without any water at all if the material is very dry. The machine is operated by a gasoline engine.

*New Way Concentrator*



Portable Gold-Washing Machine That Can Be Operated without Water if Material Is Dry

Report in Electrical World  
 10th Ave and 36th St  
 New York

Dr. O. A. Kennerly  
 214 Martin St.  
 Klamath Falls, Ore.



41178

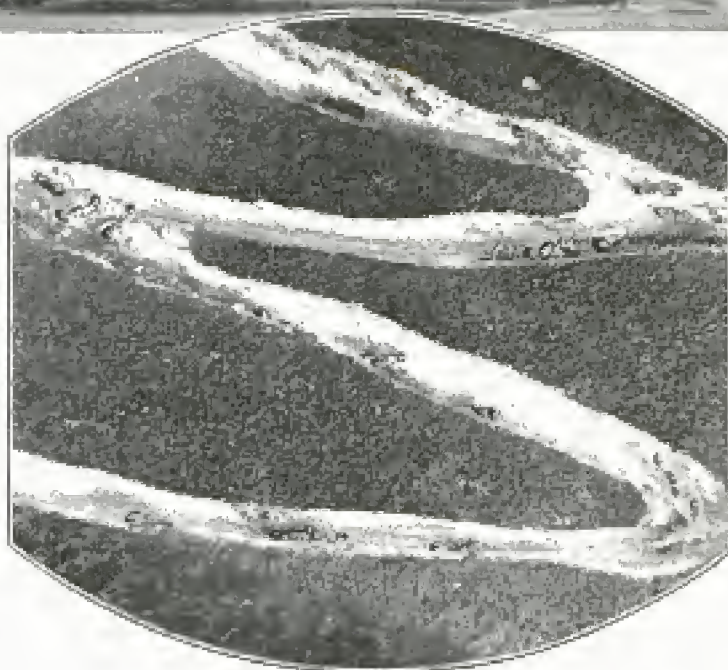
Com. John F. Cogswell,  
16, Edgemoor Road  
Belmont, Mass



# ANTS

almost human  
in their

# Actions



**A**NTS raise crops for their own consumption. They have their harvest times, when they fill their storehouses and protect it against the elements. They have their own herds of food-giving "cattle" and tend and protect them with assiduous care.

Ants go into battle, marching with the regularity of disciplined troops, with scouts and guides in the van and flanking parties out at the sides. Some of them return from forays loaded with fresh supplies of food; others come back, bearing as spoils of war the young of their enemy, which are reared as slaves or auxiliary workers in the nests of their masters.

Investigators believe that ants have means of imparting information to one another—a marvelously efficient means of communication. Ants build veritable cities, often with a population of a hundred thousand or more, and carry on their community affairs with a complex

Ants Battling, Top; Left to Right, Casualty Carried off Field, Death Grips, and Two against One with Officer Directing; Building a Road, at Bottom

colony organization, co-operating in the building of the habitation, care of the young, and of one another, defense against enemies, sanitation and "policing."

These and many other amazing facts concerning the insects that outnumber all other terrestrial animals, are vouched for by Prof. William Morton Wheeler of Harvard, who is regarded as America's foremost authority on the subject.

Doctor Wheeler styles ants as the "humans of the insect world." All species are hunters of ability; many are pastoral and others agricultural. Some even show indications of carrying on a well-planned industrial life.

Ants, according to Doctor Wheeler, possess a fair brand of intelligence. While they are not able to begin with a premise and reason things through to a logical conclusion, they do have a keen memory and are able to adapt their experiences

Cambridge, Mass. 941





to meet utterly new situations with success.

Probably in no one of their activities do ants show their ability to carry out well-planned operations, in mass, more impressively than in the slave-gathering forays of the so-called Amazon and sanguinary species. The location of nests offering plunder is learned by scouts, who scour the vicinity and report to the home nest. Then the army moves out and surrounds the nest of the victims with all the precision of a human army investing an enemy city.

No human babies get better care than do the offspring of the ants when they are in helpless state as larvæ. These are incapable of any great movement; they require food but cannot get it for themselves.

One evening Doctor Wheeler placed a small insect in a nest of ants. One of the ants immediately snapped at it, disabled and left it. Another ant picked it up and carried it into the chamber reserved for the young. A third assisted in tearing

the victim to pieces. Then the workers proceeded to carry it to one larva, which they allowed to feed upon it for a few minutes, and later they gave a second its ration and fed others in turn.

"In the dry districts of western Texas," said Doctor Wheeler, "I have seen ants bring their young to the surface in the cool of the evening and carry them to and fro, just as human nurse maids wheel babies in their perambulators in city parks."

Harvester ants are most efficient husbandmen. Late in the afternoon, long files of workers may be followed for a distance of sixty or ninety feet from the nest before the ants disperse among the scant vegetation in search of seeds. They eagerly seize upon all the mature seeds they find and carry them to the nest, where they carefully remove the husks and store the edible kernels in the granaries. The chaff and seed pods are then carried out and dumped in a refuse heap.

Once harvested, the stored crop is well taken care of. One species actually bites off the germ from each seed, so that it cannot sprout. If the seeds become wet, all the seeds are carried out

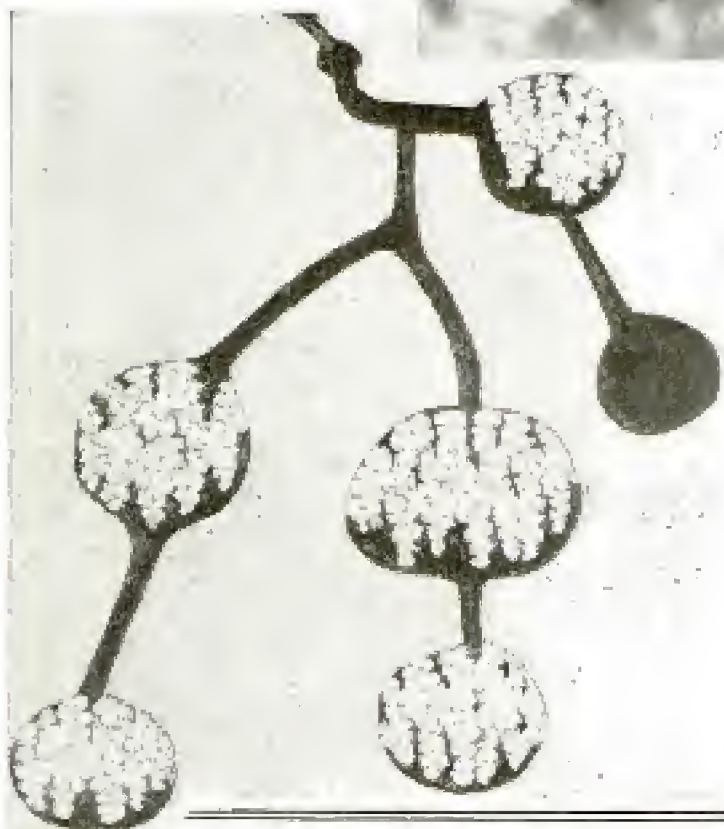


Ant Gardens in Trees, Top; Soldier-Worker, Center, and Honey Ant Feeding Workers



and laid in the sun to dry, the first clear day, and are then returned to the storage chamber.

Harvester ants do not plant and grow their own crops, but in South America there is one tribe, the Attii, that does. The main article of diet is a very small fungus. The Attii excavate nests with a series of chambers, each the size of a man's head. Into these chambers they carry small pieces of plant leaves



Microscopic-Camera. Photo of Ant, Top, and Fungus-Growing Ant Chambers, Each About the Size of a Man's Head

upon which the fungus spores grow and multiply rapidly. In some of the older nests, the chambers are found to be three-fourths filled with the fungus mass, upon which the ants and larvæ feed.

Many ant tribes maintain large herds. Their cattle are the aphids, commonly called plant lice, that perch upon the stalks and roots and suck the juices of plants.

Many ants construct, often at some distance from their nests, little closed pa-

vilions or sheds of earth, carton or silk, as a protection for their cattle and for themselves. The young cattle are put out to pasture, as it were, during fair weather, but in bad weather or on cold nights, they are taken back into the burrows.

In the ant community, the work is divided most intelligently among the workers. A certain number tend and feed the larvæ, others look after the feeding of the queen, some harvest the food seeds and care for them in the storerooms, others attend the herd, while the larger and more formidable members of the colony are told off as soldiers and guards.

The soldiers guard the nest. One species lives in the interiors of the galls of oak trees. The entrance is made exactly the size of the heads of the soldiers. Day and night, they take turns in closing the opening with their heads, and on signals from a worker let it in or out by withdrawing from the entrance.

Some ants, notably those of the bulldog tribe, are fierce defenders of their nests. At the first alarm, they jump out of the side door of their mound and fasten upon the first living thing they encounter. The unwary intruder, who does not know of the side door, generally succumbs to a rear attack of the ants.



9/19/47

944

Comd. John L. Coggeswell,

POPULAR MECHANICS

16. Edgemoor Road

Belmont  
Mass



Army's "Shotgun" for Bringing Down Enemy Planes Has Four Machine Guns Mounted Together on a Truck; 2,400 Bullets Are Fired per Minute

## UNCLE SAM'S LATEST WEAPONS FOR WAR IN THE AIR

Four machine guns, capable of firing 2,400 half-inch bullets per minute, have been mounted as a unit on fast trucks to guard the United States army from low-flying enemy airplanes. Firing is arranged so that the bullets, instead of traversing parallel paths, lay a pattern similar to that of a charge from a shotgun. In tests on a flying target at 1,000 yards, the gunners put over ten per cent of their bullets into a section corresponding to the vital parts of a plane. Automatic height and range finders make for extreme accuracy. When the finders are ranged upon and follow the plane's flight, they automatically give the guns the correct "lead" on the moving target, just as an experienced hunter leads a flying bird with his aim. The assembly is capable of

sixty miles an hour on good roads. A companion piece is the new chassis-mounted, semi-automatic three-inch anti-aircraft gun, which discharges twenty-five high explosive shells per minute with a range of over 5,000 yards. This gun will bring down a plane within 100 yards of the explosion.

## WEST INDIES TO BE "WEIGHED"

By "weighing" the West Indies with apparatus which determines the difference in gravity at different points on the earth's surface, an international expedition hopes to obtain more information on the origin of the islands. A United States submarine will be used by the expedition in determining the relative stability of the islands, the manner in which they have been formed and in seeking to throw more light on the origin of the

major inequalities of the earth's surface. Five thousand miles of submarine profiles will be measured and thirty to forty gravity-at-sea stations will be established to help weigh the islands, as well as to sound the deepest parts of surrounding water.

## PIPE CLIMBS TWO-MILE WALL WITH CANYON WATER.

Construction of a pipeline, which will climb two miles up the wall of Grand Canyon to carry water to a settlement on the rim, will be completed soon. Erection of an 8,000-foot transportation cable between the settlement and a point far below the canyon rim marked the start of operations. This cableway is built in four sections, with transfer points, to avoid too great a strain in carrying heavy loads, such as the steel pipe and the big pumps.

Prof Richard M. Field  
Dept. of Geology, Princeton  
University, Princeton, N.J.

James G. Thompson  
of  
Phoenia  
and  
Republic  
of  
Phoenia  
and  
Republic  
of  
Phoenia



**CAT'S EYES SEE FORTY TIMES  
 BETTER THAN HUMAN'S**

*Germany*  
 That a cat can see forty times better in the dark than a human has been established by a German biologist at the university of Koenigsberg. It has long been known that a cat can see better, but just how much better had not previously been computed. The reflecting tissue that lines the rear of a cat's retina, and the results of which can be seen when a cat's eyes shine in the dark, really acts as a light amplifier, it has been found. The human eye has no such lining. The "reflector" sends the rays falling on it back to the front of the retina where the nerve rods and cones are located, thus augmenting the light stimulus coming from the outside through the eye's lens. The color of the reflector varies in different animal species, but regardless of its color it will reflect light waves of the same length as those received.

**WINDMILL MADE OF OLD IRON  
 IS GARDEN DECORATION**

Old iron is the material with which an Englishman has landscaped his flower garden. One of the artistic effects is a windmill, the base of which is formed by an old potato-washing machine, while the upper part is built of odds and ends of metal picked from a heap of scraps.



Decorative Windmill Made of Old Scrap Iron for a Garden; the Base Is an Abandoned Potato-Washing Machine

*H. Scott Baker*  
*Potter St. Essex England*



Long-Range Tear-Gas Gun, Like a Sawed-Off Shotgun, Which Shoots a Gas Shell 180 Yards

**TEAR-GAS GUN FIRES SHELL  
 FIVE HUNDRED FEET**

One officer, armed with a long-range tear-gas gun and shell, recently developed, can disperse a crowd at a distance of more than 500 feet, for the weapon fires its ten-inch tear-gas projectile 180 yards. The weapon resembles a sawed-off shotgun, about thirty inches long, and throws the shell over a high trajectory, so the user can fire from behind a wall.

**RADIO AND ELECTRICITY SPEED  
 HARDENING OF STEEL**

Hardening of small metal parts, such as those used in typewriters and sewing machines, can be speeded up by the use of high-frequency radio currents, ultraviolet light and the electric spark. Research metallurgists have found the steel can be given this desired case-hardening by nitriding, involving the heating of the metal while it is placed in a nitrogen atmosphere. After many hours of heating in contact with nitrogen gas, the steel is cooled and its surface becomes hardened. By subjecting the metal to ultraviolet light or to electrostatic fields caused by the electric spark or high-frequency radio currents, nitriding has been speeded up and case-hardening has been accomplished in a short time. While the latter method is not commercially practicable at present, further experiments may make it so.

*John J. Egan, metal.*  
*burgh Long Island*  
*City N.Y.*

*Capt. A. F. Sperring*  
*Cleveland Ohio*  
*no further information*

*91917*  
*Before American Society for Steel Heat Treating*  
*7016 Lorain Cleveland Ohio*





It is fascinating, adventurous work, too. That life is lonely and weary aboard a lightship is an hallucination. Life aboard a lightship, particularly the "Five-Fathom," is a hectic existence

Crew of the "Five-Fathom" Lightship Holds a Fire Drill at Station off New Jersey Coast

*Wide World*

**M**ORE happens during a twenty-four-hour watch on the "Five-Fathom" lightship anchored thirty miles out in the Atlantic ocean, than in many a high-powered factory, running full blast, back on terra firma. There is work—plenty of it—every moment.

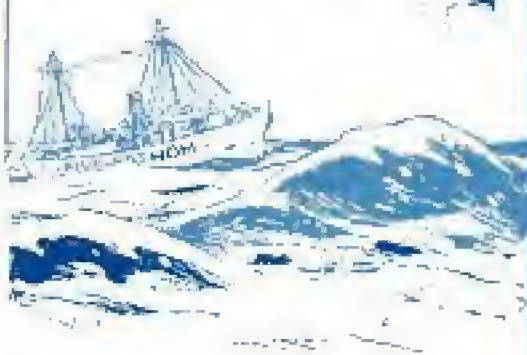
Let a member of the "Five-Fathom" crew slow up in his tasks, and he throws a hitch in the great sea mistress that vigilantly, indefatigably guards the vessels plying the busy Atlantic seaboard. The tiniest cog out of place is enough to halt the routine of the day. This eagle-eyed mistress never sleeps.

with hardly time allowed for breathing spells. Real romance often pops up out of the sea. But this work of watchdog of vessels is not easy. It is dangerous. Helping a ship in distress, rolling constantly in treacherous waters, lying in the path of many steamers through fog and storm—is all in the line of her duty.

Thirty miles east of Cape May, N. J., proudly floats the "Five-Fathom," the largest and one of the most up-to-date lightships in America and, perhaps, the entire world. She stands as a model for the fifty-two other lightships that keep vigil on the coasts of the United States.



# Fathom Lightship



She is a bustling scientific workshop; she is absolutely the height of nautical mechanics. Few palatial steamers surpass her in comforts and conveniences. And rare are the vessels better equipped to subdue an angry sea or conquer a vicious storm.

The region of the "Five-Fathom" has been marked by comparatively few disasters within recent years. But when a calamity does occur, it more



than makes up for the intermittent periods of peace and quiet. There is excitement galore aboard the lightship then. There are tense dramatic moments. No battle on land, no matter how tumultuous with explosions of bombs and rat-

tat-tats of machine guns, compares with the conflict on the sea of the elements against man's ingenuity, combined with the peaceful sciences. Here's a typical picture:

The lightship is lolling in the water like a self-satisfied old duck; her heart of machinery purrs away delightfully. In the background the sun is setting in all its glory. It is a truly beautiful scene. Suddenly the radio operator darts out of his cabin and shouts, "Quiet men!" No more is necessary.



"Air" View from the Foremast; Close-Up of One of the Lights, and Pilot-house





The men know what that means—something is wrong aboard a ship close at hand. The crew rush to the door of the operator's cabin. They go no further. The radio cabin, with all its mysterious instruments is a sacred place. The men huddle about the door as closely as they can. All eyes are strained on the operator who wipes off his earphones.

"Captain, there's a ship sinking outside Atlantic City. Machinery broken down or something."

"How far away?"

"Forty-five miles."

"Relay the message to base nine of the coast guard and then communicate with vessels in the vicinity of the sinking ship."

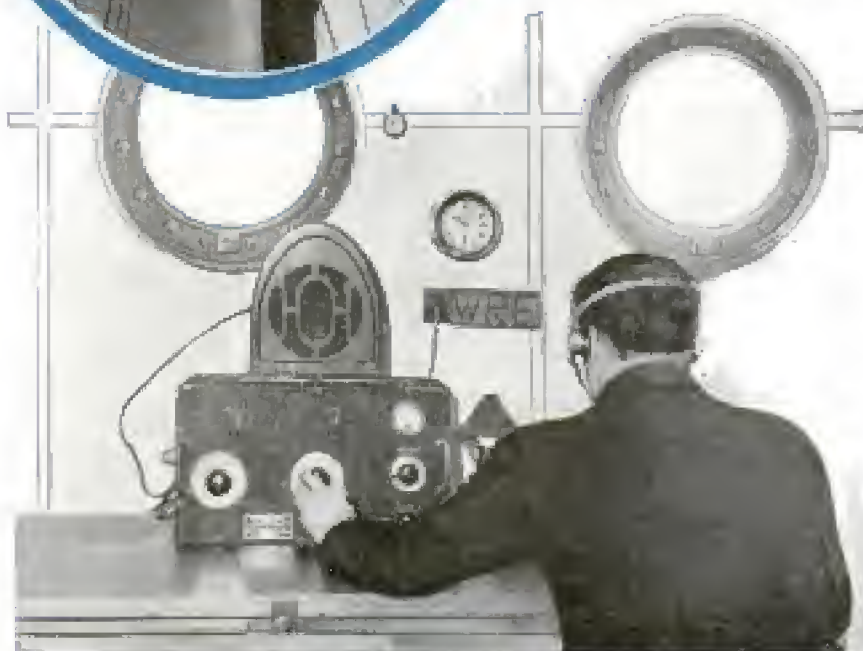
No sooner said than done. Ten minutes later, the radio operator again wipes off his earphones. "O. K., Captain! Coast

guard cutter has just reached the ship in distress."

When evening envelops the "Five-Fathom," she is lit up by electricity as gayly as a Christmas tree. She dazzles the water. Atop her thirty-five-foot beam glow two huge electric beacons. Passing liners seem to wink their approval of the guardianship.

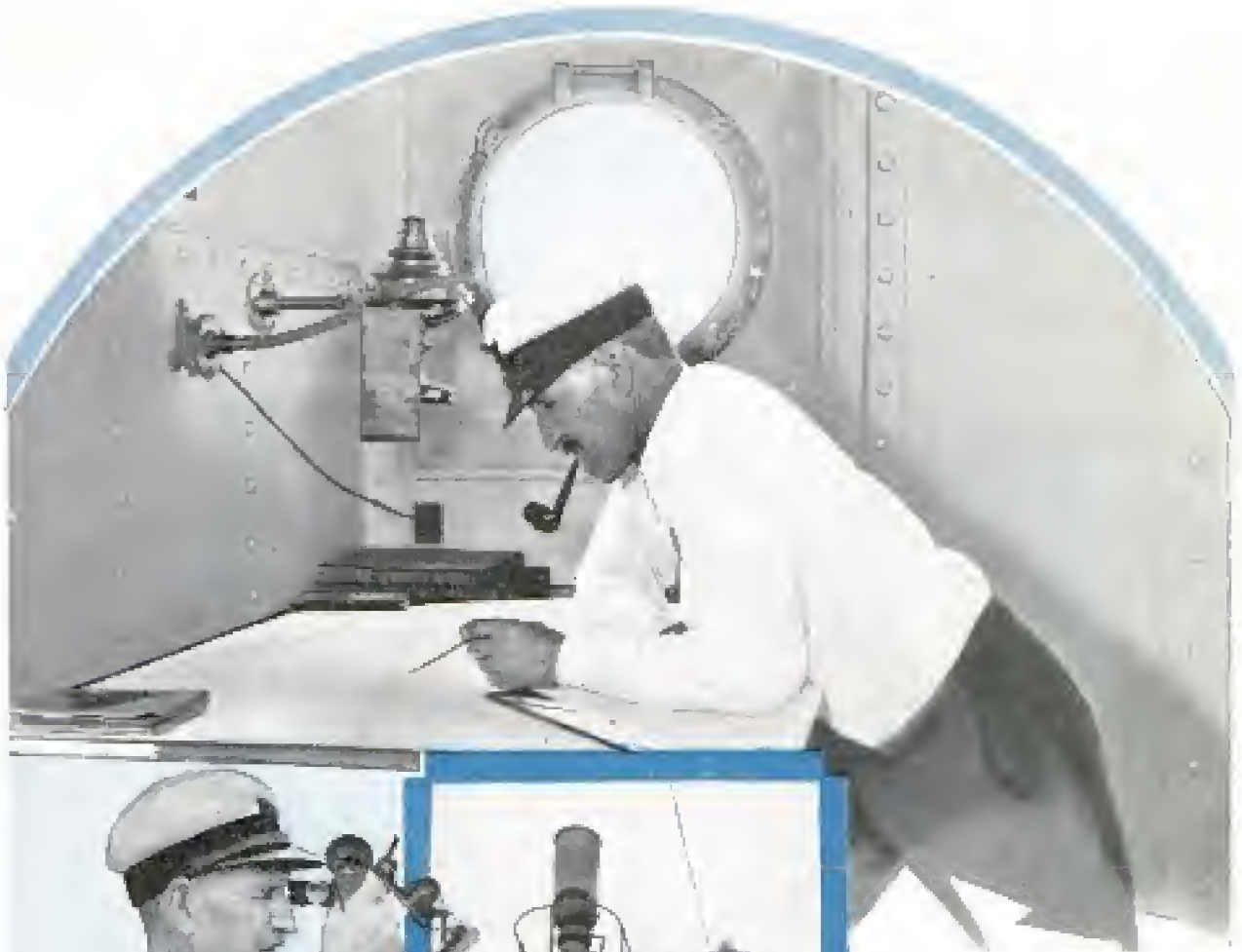
All the while, night and day, the most important work of the "Five-Fathom" goes on. Silently, without human operation, the radio beacon has been aiding scores of vessels up and down the Atlantic. There is a staccato tick-tock now

and then, but it is a humming noise pleasing to the ears. The crew may eat, drink, sleep, seek entertainment or go ashore on leave, but, no, not the radio beacon. Nothing but a little oiling for this super-sentinel of the sea. Seldom is praise bestowed upon it though it saves thousands of lives, let alone thousands of dollars, every year. The "Five-Fath-

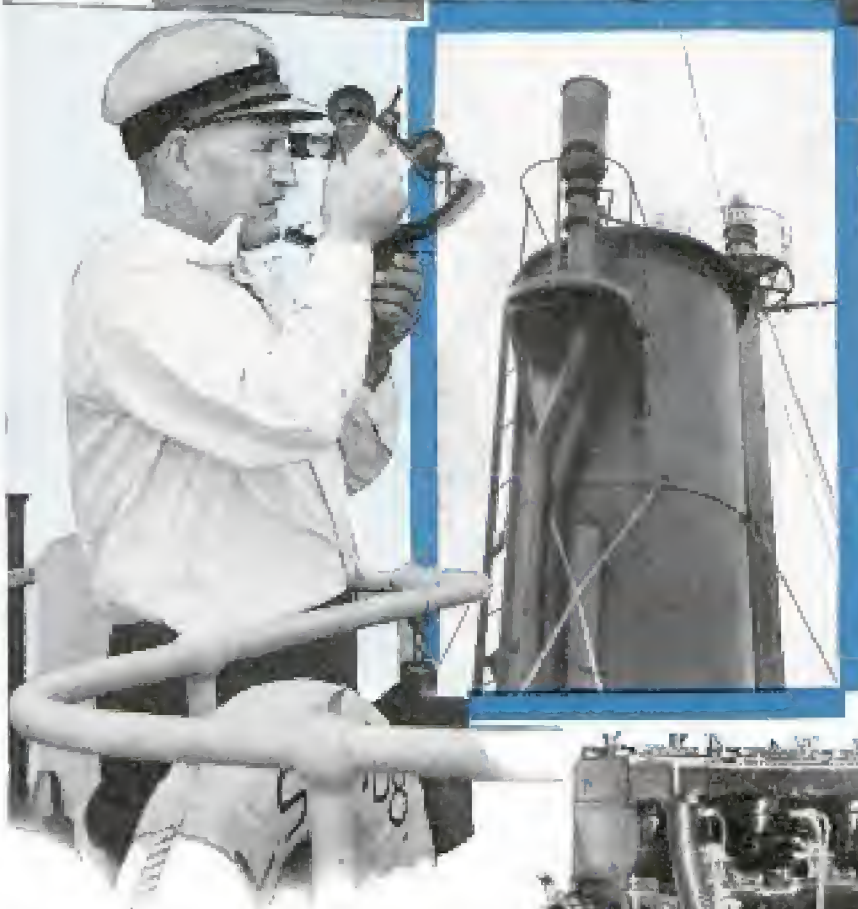


Submarine Bell Being Lowered over Side; a Light Mast Seen from the Deck, and the Radio Operator at Work





Captain Johansen at Work on the Charts; Fog Horn, 3 Foot in Diameter, at Left

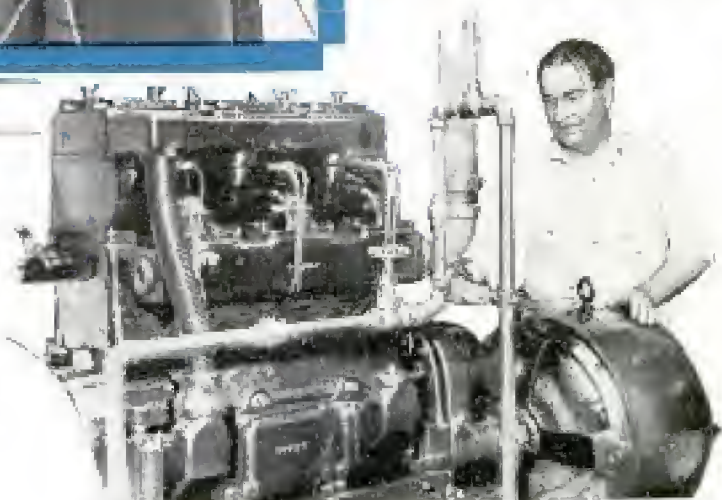


Master Alfred Johansen on the Bridge, Checking Position, and Right, Electric Generating Plants for Lights and Radio

om" radio beacon is one of the most powerful and most useful of the eighteen radio beacons on lightships on the coasts of the

United States. It was one of the first in the world and is available up to several hundred miles at sea, far beyond the usefulness of any other aids to navigation.

Any number of vessels properly equipped with





Q1592

con aboard the "Five-Fathom." It functions on much the same principle as do light and sound signals; that is, it is placed at an important point of navigation, which is shown on the charts. It periodically sends out signals with a distinguishing characteristic. It transmits for a period of fifteen minutes out of every hour. The signals are sounded for a minute and are followed by a silent interval of two minutes to allow for the staggering of other radio beacons. The frequency of adjacent radio beacon stations is staggered in order to avoid interference when they are operating simultaneously. The actual transmission is effected by a simple automatic keying device.

Prior to the development of the radio beacon the navigator ascertained his position at sea by astronomical observations, but as this was impossible in foggy or cloudy weather, he was called upon much of the time to sail his vessel by dead reckoning that often proved disastrous. No accurate allowance could be made for the drifts from ocean currents and the skip-

a radio compass, or direction finder, may take bearings simultaneously on the "Five-Fathom" radio beacon. The beacon, working in conjunction with radio compasses on board passing ships, takes bearings and cross-bearings on other ships in order to avoid collision in fog and storm; it also takes bearings on any vessels in distress, so that they may be correctly located and quickly approached. There is absolute accuracy because of the charted location of the "Five-Fathom" with respect to the land.

Many a sea disaster and consequent loss of life and property has been averted or minimized through the bea-



How Anchor Chain Is Brought through Bow; Foremast Light Bulb, and the Lightship at Anchor over the Bank



*By Truman & Fuller  
Schenectady  
N.Y.*

POPULAR MECHANICS

*Q 1847*

*Spencer Heater  
Co.  
Williamsport  
Pa. 951*

per's first task with the clearing of the skies was to take his bearings and learn his whereabouts.

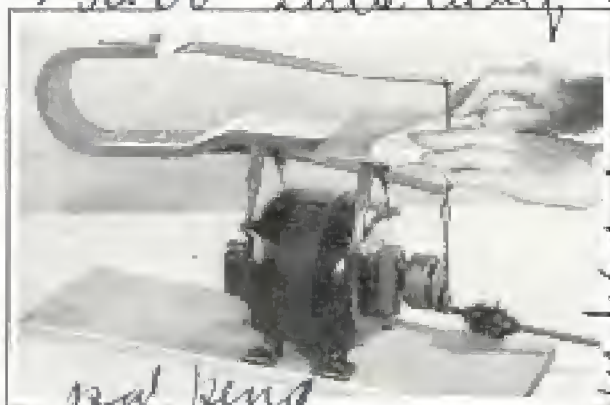
Today, as long as he is within range of the radio beacon, he need not be in doubt. Weather conditions have no effect upon either the operation or the accuracy of the radio beacon. The element of chance has been virtually eliminated.

### STEAM WEAKENS STEEL

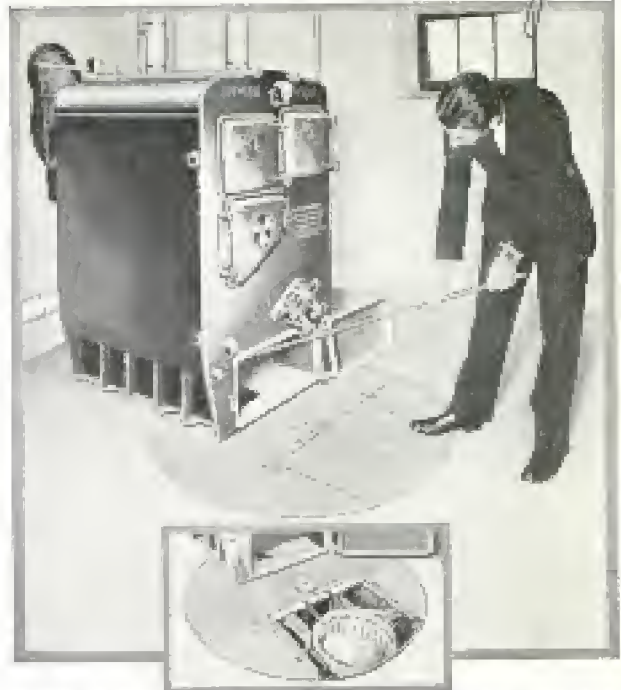
Steel subjected to sprays of steam weakens perceptibly, the American Society for steel treating was told at a recent meeting. If the steam is wet or contains an excess of oxygen, it causes an even greater loss in the steel's resistance to breakage, the society was informed. Even nickel and chrome-iron alloys, which withstood ordinary steam, give way before this combination. In the case of some specimens, when liquid water and oxygen both were present in the steam, the steel lost up to half its resistance.

### ELECTRIC JIGSAW DOES MANY TYPES OF WORK

Fast and clean cutting of wood, fiber, bakelite, aluminum and many other materials, is possible with an electrically operated jigsaw now on the market. It is practical for cutting wood two inches thick. Motor power is applied directly to the blade through a connecting rod eccentrically mounted on a crank disk which supplies 1,725 one-fourth-inch strokes per minute. Blades are interchangeable and may be obtained for any type of work. One of these is a double blade for inside cut and scrollwork.



Speedy, Clean Cutting Is Easy with This Jigsaw, Mounted on and Operated by Electric Motor



Ashes Are Raked into a Can beneath the Furnace Floor, Eliminating Shoveling and Dust

### ASH CANS UNDER FURNACE PIT KEEP CELLAR CLEAN

Ashes disappear through a hole in the furnace-pit floor when a receiver system now on the market is used, eliminating all shoveling, dirt and dust. The ash receivers are located on a steel drum below the cellar floor, the drum revolving so that an empty can may be locked in position under the hole in the pit. When this can is full, a crank turns the steel drum to move another empty receiver into place, with the operator never touching the cans. When they are all full, the ash man lifts a steel plate, removes the filled cans, disposes of the ashes and puts the empty receivers back into place.

### ZIGZAG CURB SOLVES PROBLEM OF OBLIQUE PARKING

One Philadelphia department store has solved the problem of providing parking space for customers' cars by constructing a serrated curb on one side of the building. This saw-tooth curbing with its triangular projections compels each car to park at the proper angle and in the proper space, and also makes certain that the parked autos are parallel. In addition, passengers step out of their cars directly onto the sidewalk instead of into the street as in ordinary oblique parking.

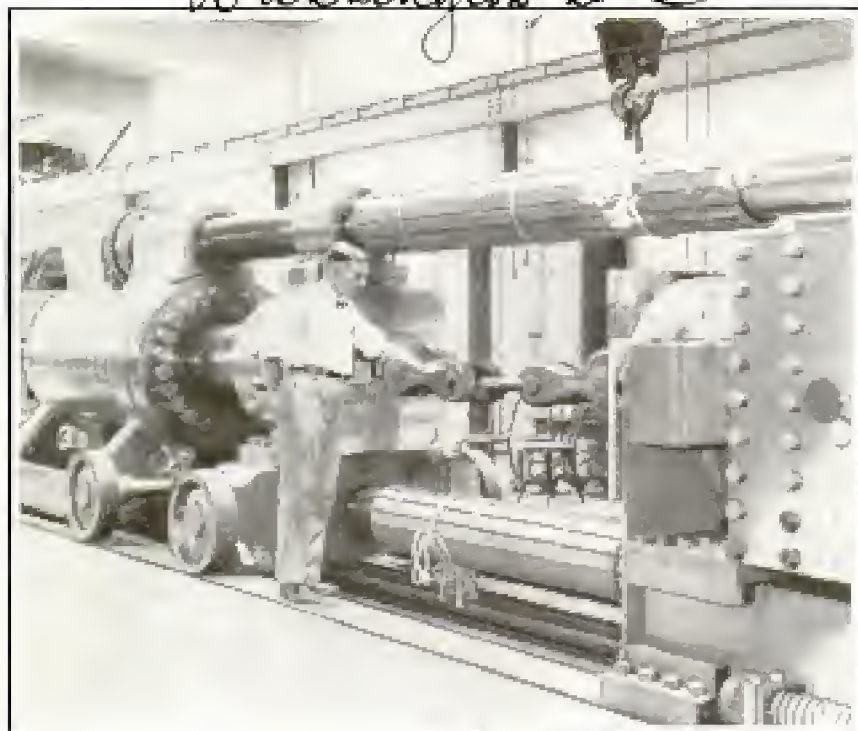
*Strawbridge & Clothier  
Philadelphia*

*Beebe Bros. 3211-23  
First Ave South  
Seattle, Wash.*



a1864  
952

W. H. A. Stutz  
Bureau of Standard  
POPULAR MECHANICS  
Washington D C



© U. S. N.

Huge Links of Steel, Used in Ship Anchor Chains, Are Torn Apart in Tester Which Applies Force of 2,300,000 Pounds

## ANCHOR CHAINS PULLED APART TO TEST STRENGTH

Heavy steel chains, such as are used for ships' anchors, are pulled apart in a huge testing machine at the bureau of standards. This machine, with a pulling power of 2,300,000 pounds, tears apart the strong alloy-steel links, which are heat-treated to withstand heavy loads.

## CHRISTMAS TREES AS SIDE LINE INCREASE FARM PROFITS

Growing of Christmas trees as a crop affords a profitable side line for farmers in parts of the United States. A market for the trees exists in every town and city, according to the department of agriculture, which points out the superiority of a shapely home-grown tree over one shipped in from a distance. The problem of utilizing idle farm land can be solved in part by growing Christmas trees, since, on many farms, there are fields exhausted by years of cropping.

land which is eroding or washing, odd corners of tillable land not handily situated for cultivating in regular crops, or excess pasture land. Production of the trees is less difficult than the growing of many garden and truck crops. Considerable care is required in starting the plantation, but once established, little time need be given to make it a success.

a1830

## A SPECIAL TRUCK GATHERS COAL FOR STUDY

Coal samples for laboratory study are obtained from mines throughout the country by a bureau of mines

truck specially equipped for this work. The samples are analyzed to determine the special characteristics and values of coal from different fields. The sampling truck contains a flat body on which is mounted a small crusher operated by a gasoline engine. To insure each sample being representative, half a ton of coal taken from the tippie is crushed and mixed and from the mixture a five-pound sample is placed in a marked bag for later examination. From the crusher the coal passes through a "rifle" which divides it into two equal parts, the first step in obtaining the sample. About 1,000 samples are analyzed each year by the bureau.

Washington D C



Coal from Mine Is Being Poured into Crusher on the Truck: a Five-Pound Sample Taken from Each Mine Is Tested

Farmer Bulletin  
1664-Dept of  
Agriculture



# Rail Fire Fighters Guard Property and Lives



Locomotive "Pumper" Helps Fight Railroad Fires Not Easily Reached by Organized Firemen; Two Members of Crew Are Shown Here Fighting Flames in a Freight Car in the Yards

Special water-pressure units, installed in a fleet of railroad locomotives, are helping one railway to fight fires in its yards, in towns along the line and in forests near its tracks. These portable units are especially useful in extinguishing flames which cannot be reached by organized fire companies. Water can be delivered from each locomotive at the rate of 4,600 gallons per hour at a distance of 115 feet. The equipment works under far less steam power than did old apparatus, with which there was danger of the crew being scalded if hose burst.

## OPPORTUNITY SEEN FOR TOWNS IN AVIATION'S GROWTH

Aviation is a new and golden opportunity for small communities of today, according to Col. Halsey Dunwoody, vice president of the American Airways system. "We have seen the effect of our 700,000-mile system of hard-surfaced roads on the personal and business life of the small cities of yesterday," Colonel Dunwoody says. "Just as the whole economic system was changed, so the airplane will bring further and even more remarkable changes. The human mind is the most

wonderful thing in the world. Next in importance is communication, which enables one mind to share its product with another. Then comes transportation, which enables the movement from place to place of material things, and man with his powers of observation and expression. History of humanity shows that with increased freedom and speed of interchange of ideas, there has come an elevation and broadening of standards of living and more complete understanding among peoples. The airplane will eliminate what may still remain of the isolation of small communities. Suburbs of the future will be from fifty to 100 miles from the present centers of the modern cities. Men will live where they want to live and work where they want to work. The airplane is rapidly removing the 't' from the word 'there'."

## WALL "PAPERS" OF GLASS

Wall "papers" made of glass are woven at a factory in a German village famous for its ancient glass industry. The glass paper or fabric is produced in various colors and patterns and is fade-proof and washable.

German mfr.  
 Lauscha { Elberfeld  
 Vetter's  
 New York

Lambert Field  
 St Louis, Mo

1948

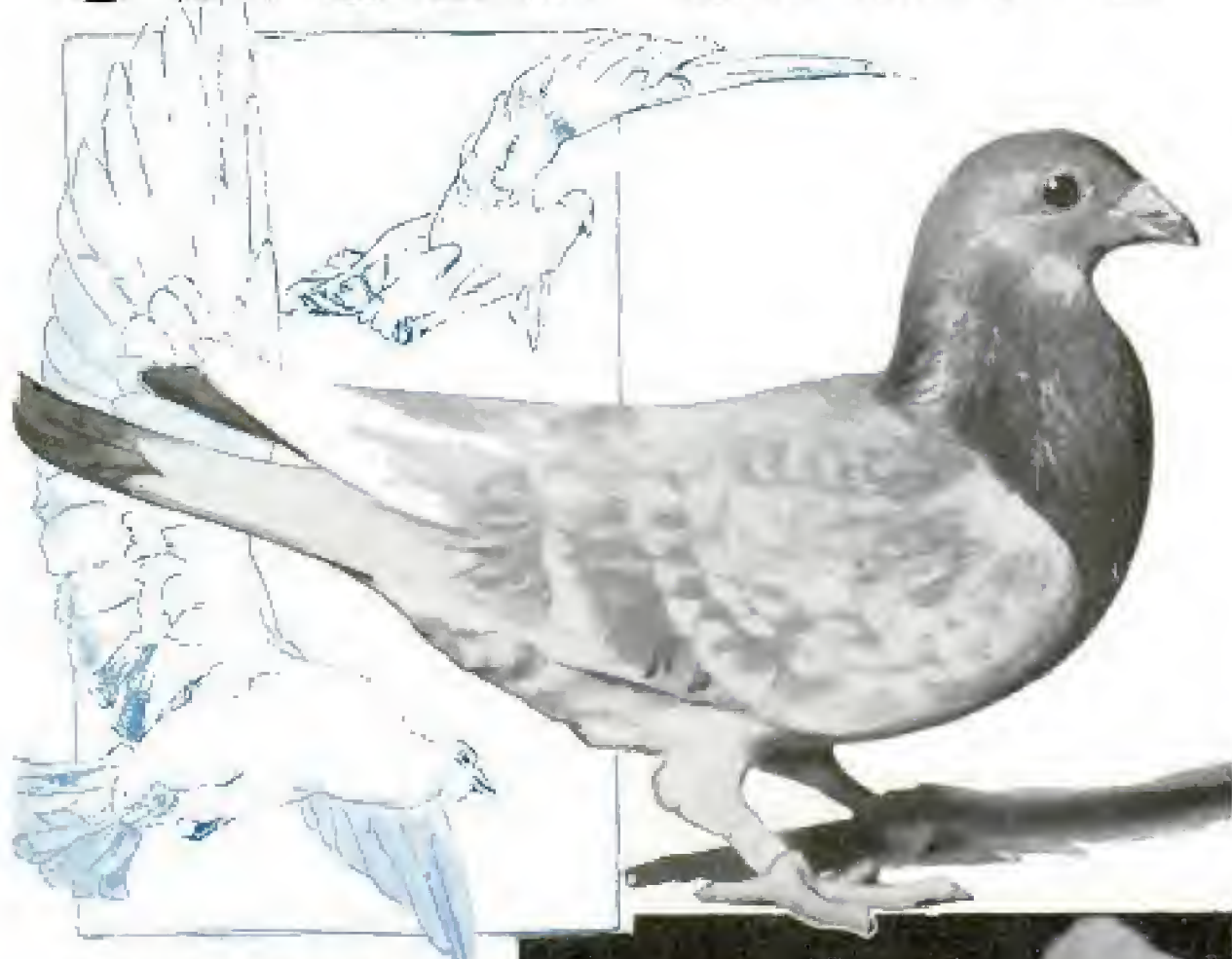
U S Agent { Reichelt  
 John C. Inc  
 Suite 801, World



91941

Cont. Esq. W. Esray Sparkell, N.Y.

# UNCLE SAM'S



By GEORGE W. GRAY

A NEW race of pigeons is in the making at Fort Monmouth, N. J., where the signal corps has its lofts for breeding and training war messengers for the army—a race of swift night-flyers.

Ordinarily a homing pigeon will not venture on the wing after dark. In sunlight it will fly for hours at a stretch, without pause for food or drink or rest. But as soon as the sun goes down, it comes down too and selects a tree-top roost for the night. With the first peep of dawn it is away again, ready to fly another twelve or fourteen hours if necessary to reach home.

If pigeons would fly at night, their value as messengers would be increased manifold. Not only would night-flyers take less time on long journeys but there



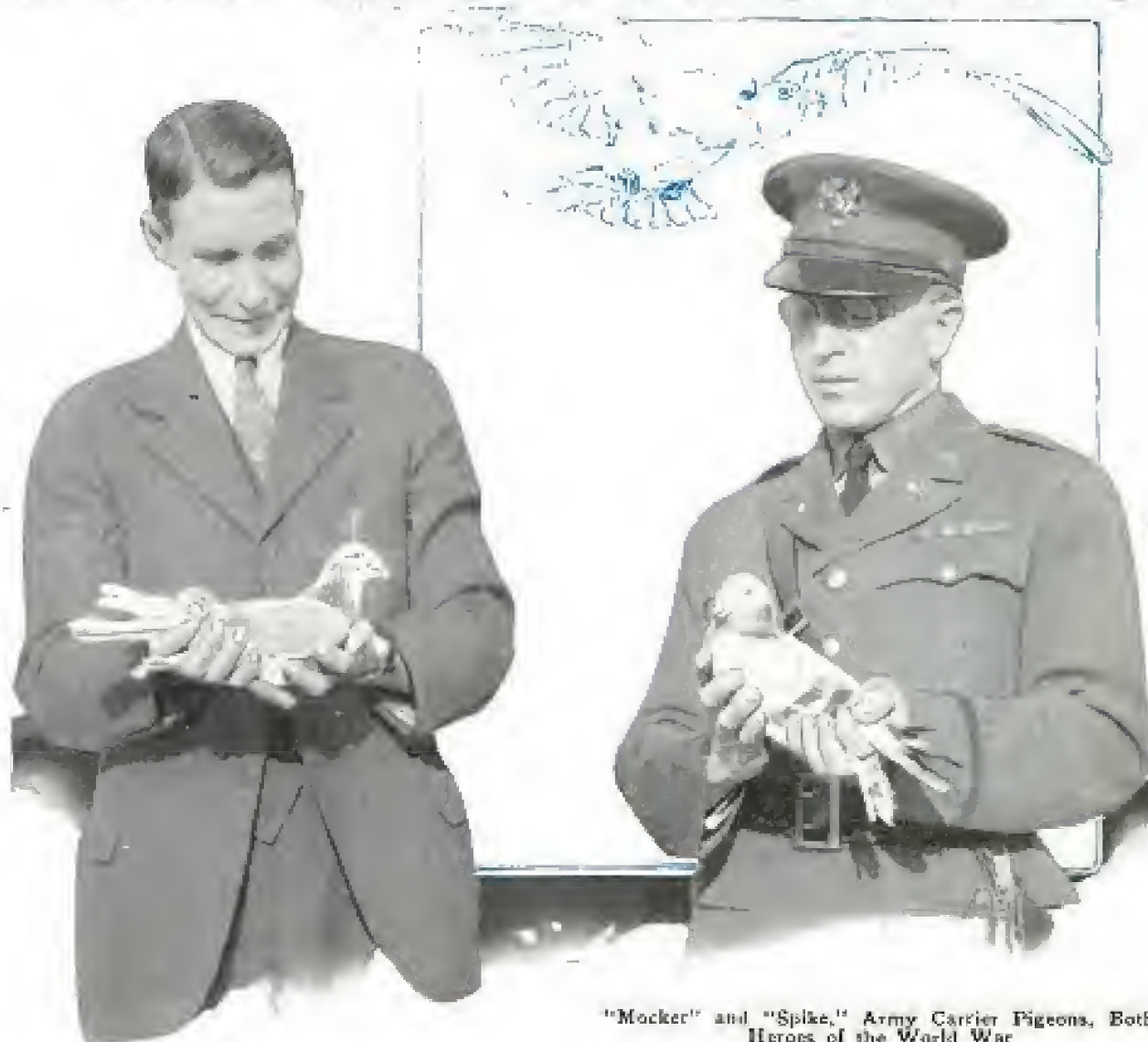
"Lele," the Army's Speediest Night-Flyer, Above, and a Nest of "Squeakers" Three Days Old

would be less risk of their being caught by hawks and other enemies, and of being shot by hunters.

Especially in time of emergency would night-flyers be priceless. Of the five pigeons that were released by the Lost Battalion in the Argonne, only one reached headquarters; the others were killed by



# FLY-BY-NIGHTS



"Mocker" and "Spike," Army Carrier Pigeons, Both Heroes of the World War

enemy bullets. One day an official report came from Hawaii to the army pigeon headquarters that electrified the fanciers. It told of four young pigeons that showed a strange fondness for darkness. When released in the late afternoon they flew home the same evening, arriving in the dark.

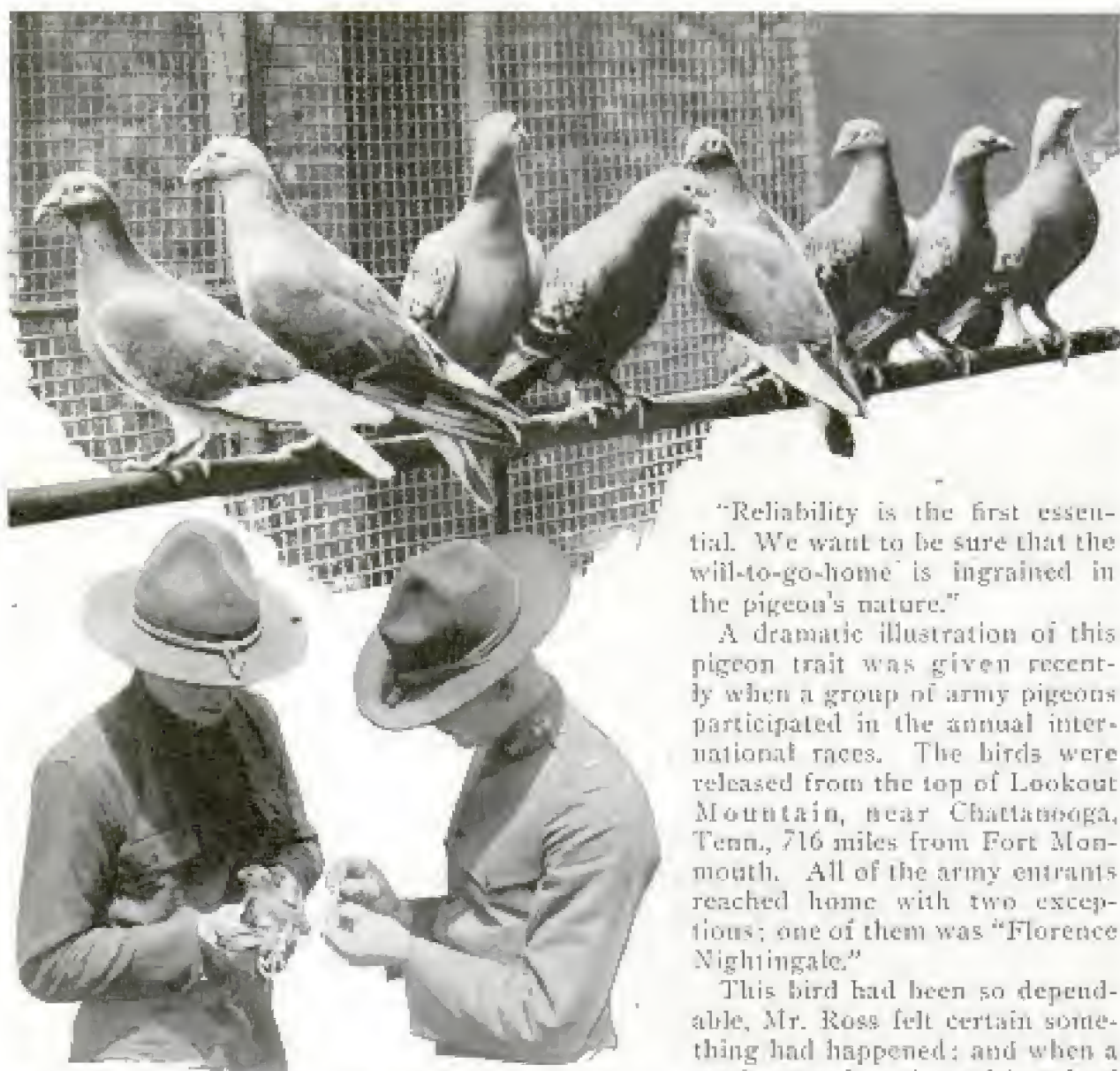
Thomas Ross, chief pigeon expert for the army, checked back, and found the parents of the four birds at Fort Monmouth. He selected other youngsters of the same strain, and chose also birds of outside strains that had shown a strong sense of direction.

When the eggs hatched, he picked the twelve likeliest "squeakers" as candidates for his night-flying squad. He separated them from the hundreds of others and

settled them in a special loft. "All day long the birds were kept inside their loft," said Ross. "A little reflected sunlight was all they ever saw. After sundown, I'd let them out for exercise, and they'd flutter around and try their wings. Every week I'd make this daily exercise period a little later in the twilight, until finally they were working wholly in the dark.

"Then, one evening, I took them out, carried them 100 yards away and released them. My helper stayed in the loft and rattled the food can, and the hungry birds hurried home for supper. The distance was gradually increased until today they are flying seven miles in the dark. They do not do so well in moonlight. A night-flyer wants an honest-to-goodness night to bring out his best powers."





Group of British Pigeons in the King's Loft, and Below, Preparing Message Capsule

The fastest time made by the Fort Monmouth night-flyers is seven miles in ten minutes. Mr. Ross expects to raise this speed to a mile a minute. One of the Hawaiian night-flyers has flown eighteen miles at a speed of 1,659 yards a minute, or 101 yards short of the present goal. This speed is not up to the velocities that have been attained by day flyers. An American pigeon has flown 300 miles at the rate of 2,100 yards a minute, which is better than seventy-one miles an hour.

"But speed is not the main essential," said Mr. Ross. "Speed depends on so many outside factors—on the weather, direction of the wind, fogginess. A pigeon won't fly in a fog, and for some unknown reason an east wind slows it down.

"Reliability is the first essential. We want to be sure that the will-to-go-home is ingrained in the pigeon's nature."

A dramatic illustration of this pigeon trait was given recently when a group of army pigeons participated in the annual international races. The birds were released from the top of Lookout Mountain, near Chattanooga, Tenn., 716 miles from Fort Monmouth. All of the army entrants reached home with two exceptions; one of them was "Florence Nightingale."

This bird had been so dependable, Mr. Ross felt certain something had happened; and when a week passed and nothing had been heard or seen of the bird, he gave her up as lost.

One noon, twenty-four days after the race, "Florence Nightingale" was found hopping along the ground in front of her loft. Her right wing dragged helplessly. The bone had been shattered by a bullet. Some hunter, seeing a flying bird, had shot her.

Another promising hen pigeon, "Molly Pitcher," was among the missing.

Twenty-five days later a message came from Camp Dix. An officer there had seen a pigeon drop out of the sky and flutter to the ground. He found it was wounded, and its leg tag identified it as one of the Fort Monmouth stock. Mr. Ross recognized at once his missing "Molly Pitcher." She too had been the victim of a shotgun.



918 19. Chase Corporation  
1500 Walnut  
957 Phila

## POPULAR MECHANICS

"But in spite of pain and hunger, she had kept on the homeward way," said Mr. Ross, proudly. "Camp Dix is between Chattanooga and Fort Monmouth, and when she reached it, she must have been near exhaustion. She saw below her an army camp, a place that was not Fort Monmouth but akin to it. So she landed and allowed herself to be caught. I count her one of the smartest birds in the army."

It is this kind of reliability plus intelligence that Mr. Ross hopes to develop in the new race of night-flyers. He wants the birds to be so dependable that, if ever again there is a Lost Battalion, it can release a pigeon under cover of night and feel confident that it will fly immediately to headquarters.

918 33

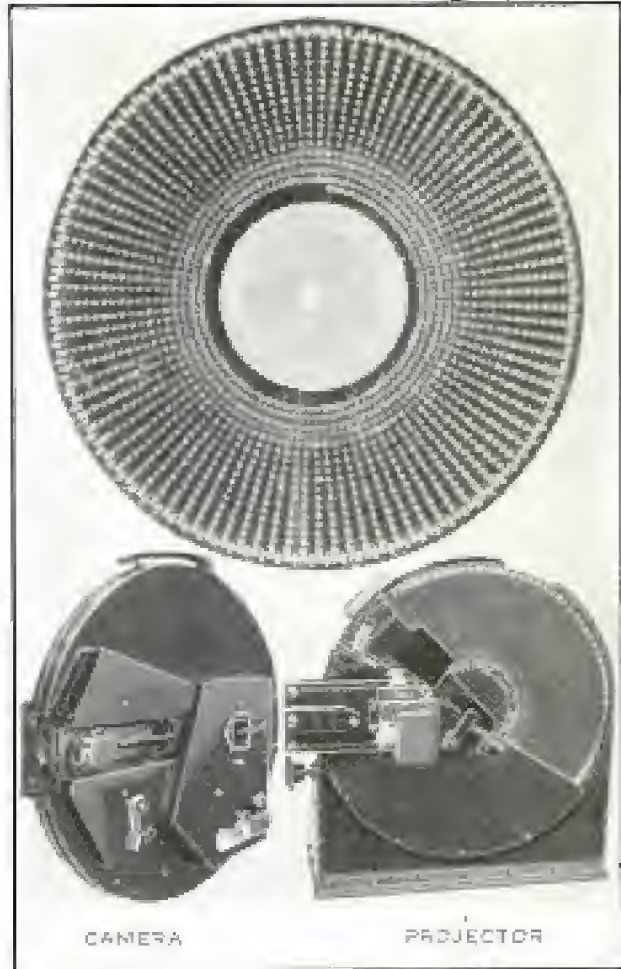
### BROOMSTICK AND AUTO HORN MAKE MUSIC INSTRUMENT

Out of a hollow broomstick and an old auto horn, a German youth has constructed a one-string musical instrument that combines the tone and characteristics of both string and brass instruments. Incorporated in the horn and broomstick to produce the necessary volume, is a membrane from a phonograph. The odd combination is played with a bow, and the fingering is the same as for any other type of string instrument. The tone is rich and pure, and the volume is sufficient for concert work.



One-String Musical Instrument Made Out of a Hollow Broomstick and an Old Auto Horn

Emil Häggberg  
Berlin, in Vienna Austria.



Two Thousand Images Photographed on a Single Disk Instead of on Movie Ribbon Film

### MOVIE PHOTOGRAPHED ON DISK INSTEAD OF RIBBON FILM

Motion pictures are recorded on a disk instead of on ribbon film with a new camera especially devised for the purpose. The image registers on the disk in spiral sequence. Two thousand images can be photographed on a single disk, being equivalent to fifty feet of sixteen millimeter ribbon film. Distortion that ordinarily would result from the spiral arrangement has been compensated in the camera's design, and the focus automatically changes as the lens moves outward along its track to project the image on the film. Advantages claimed are that the disk is cheaper and easier to develop than ribbon film, that it requires no winding, or rewinding in projection, that there is no chance of running the film backward and no mending ever is necessary.

Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Chase Corporation  
1500 Walnut  
957 Phila

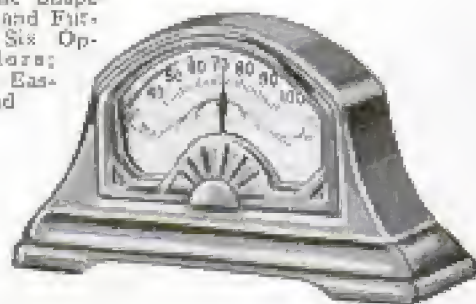


# MAKING HOME TASKS

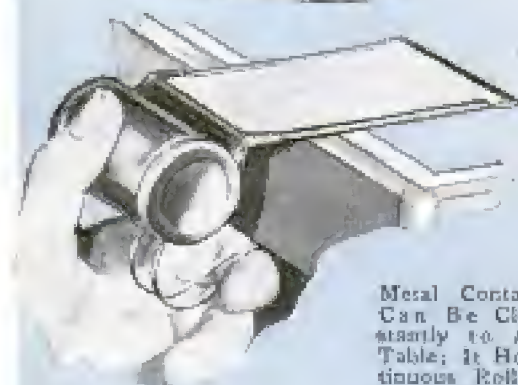


Easily Handled High-Suction Cleaner That Can Be Operated in Corners and under Furniture

Desk Thermometer Made in the Shape of a Clock and Furnished in Six Optional Colors; It Is Very Easily Read

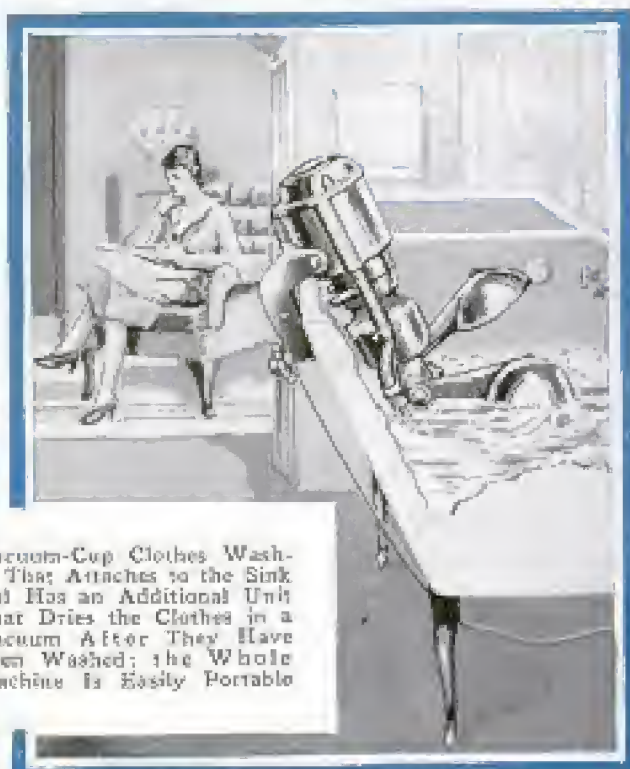


This Rubber Soap Dish Attaches by Vacuum Feet to Any Surface; Top View Shows the Underside; Note Special Drain Fitting for Water That Might Otherwise Collect in the Dish with the Soap



Metal Container That Can Be Clamped Instantly to Any Card Table; It Holds a Continuous Roll of Paper Marked Off for Bridge Scoring

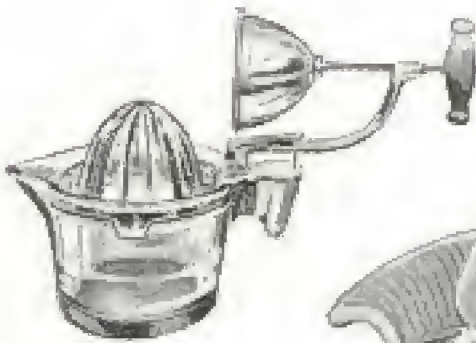
Metal-Frame Holder for Half-Gallon Bottle Makes It a Pitcher; It Is Locked Securely by a Catch



Vacuum-Cup Clothes Washer That Attaches to the Sink and Has an Additional Unit That Dries the Clothes in a Vacuum After They Have Been Washed; the Whole Machine Is Easily Portable



# A PLEASURE



Non-Rusting Fruit-Juice Extractor That Fits over Glass Pitcher and Combines Speed with Removal of All the Juice



Electric Hotplate Furnished in Many Color Combinations to Match Your Breakfast Nook



Compact Wall Bed That Folds When Not in Use; It Is Fitted with a Mantel Shelf with Draperies and, When Unfolded, Opens to a Full-Size Bed



Heater That Burns Solidified Alcohol Provides Sufficient Heat for One Room and Is Particularly Useful with Baby in Home



This Automatic Food and Drink Mixer Operates on Water; It Will Fasten to Any Faucet by Means of a Chain; the Tube Can Be of Any Length and Power Is Provided for the Mixing of Liquids of High Viscosity



91922

no information

960

as to firm making this

Clipping from Houston,  
Texas paper

# POPULAR MECHANICS



The Pick-Proof Lock Demonstrated by Its Inventor; Combination and Key Both Are Necessary

## KEY-AND-CODE COMBINATION LOCK IS PICK-PROOF

Studying with experts in lock picking, and learning all the underworld's secrets in the "art," a Californian has invented a pick-proof lock. The lock is a double one, consisting of a knurled knob around the keyhole. The knob must be turned to a code before the key will open the lock.

## BLOTTER MADE OUT OF STONE RENEWED BY HEATING

A manufactured stone which blots any ink on any paper, has recently been introduced, cut in a curve like a desk blotter. It weighs just enough to be useful as a paper weight also. It is said the stone blotter absorbs ink instantly, leaves no lint and will not offset. The stone can be renewed by heating it to a red color for a few minutes over a stove burner.

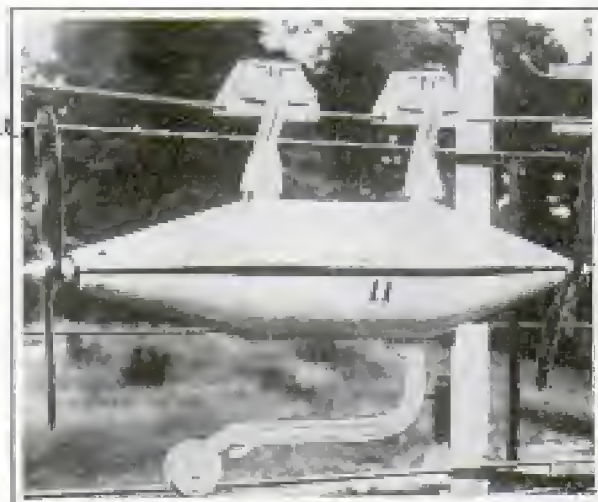
## AUTO DASH DIAL CHANGES TO HELP MOTORISTS

High speeds and traffic congestion have caused motorists to disregard the instruments located on the dash because they cannot permit their eyes to rove from the road. This has caused one British automo-

tive engineer to suggest radical changes in the location of the instruments to bring them more nearly into the range of driving vision. By actual tests, he determined that it takes from one and one-half to three and one-half seconds for drivers to take their eyes from the road, focus them on the dash and refocus on the road, the average being about two seconds. At forty miles an hour a car in that interval would travel 116 feet, and at sixty miles an hour the driver would ride "blind" for 176 feet. It is suggested, therefore, that some of the important instruments requiring frequent inspection be moved from the dash to the radiator cap, or to a point near the center of the hood. This, of course, would reverse the present trend of design, which is to keep the cowl and hood as clear as possible. It is believed, however, that the speedometer and motor-beat indicator might well be grouped in an ornamental standard on the radiator where they would be almost in the direct line of driving vision.

## AERIAL TORPEDO CARRIES MAIL ON OVERHEAD CABLE

Intended for transporting mail, an aerial torpedo, running on an overhead cable,



Aerial Torpedo Running on an Overhead Cable Which Is Proposed for Transporting Mail

is the invention of a Berlin engineer. With propellers fore and aft, it is hung from a cable and below is a guide like a trolley wheel attached to a second cable. The inventor claims that with such a system established, a letter could be sent across Germany in forty minutes.

Herr Richard Pfautz

Copyrighted material

Barold marks, San Quentin, Calif

American Association of Manufacturers  
97 W. Green  
1819  
11/3/21  
Little sold  
Cmly. J. B. Amce. 1521 Manger  
Houston, Texas



Reported to American Society  
of Refrigerating Engineers  
39 W 99th St  
ALUMINUM AS HEAT INSULATOR  
COVERS STEAM PIPES 9/18/31

## ALUMINUM AS HEAT INSULATOR COVERS STEAM PIPES

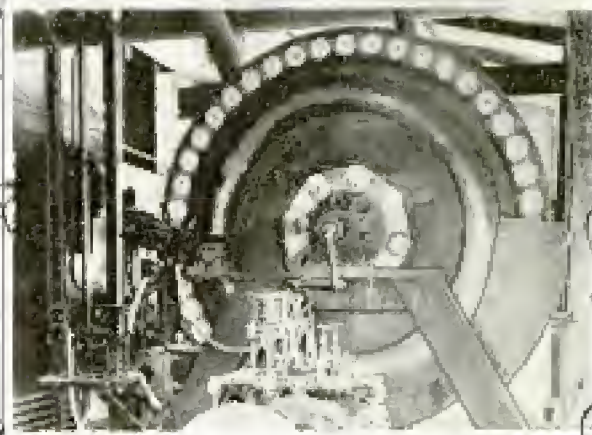
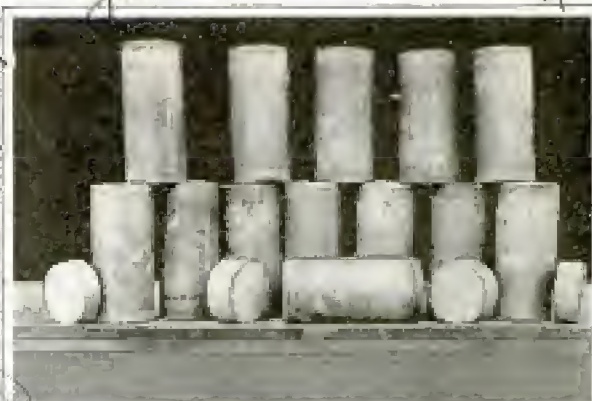
Aluminum foil, crumpled irregularly and assembled in layers, is being used as an effective heat insulation. The metal sheets are as thin as paper and the limited area of contact transfers little heat. The foil has the additional advantage of not storing the heat and of being untarnished by air. Aluminum has been used for both brine and steam pipes on German cruisers and for hot-water pipes in homes and factories both here and abroad. One French vessel has been fitted with four tons of the metal sheets where under old methods, 380 tons of cork and magnesia would have been required. by Max Bracton

## DOUGHNUT AUTO TIRES OFFER EASIER RIDING 9/18/31

Doughnut tires, the super-balloon types taking from ten to twenty pounds of air pressure, are being extended to trucks and pleasure cars after being used with success on airplanes and on airport and golf-course tractors. Advantages claimed for these tires include greater riding comfort, twice as much surface on the road, with consequent greater traction and less tendency to skid, and added mileage. General adoption probably will involve redesigning of wheel and axle assemblies and the improvement of steering mechanisms. Hydraulic steering has been used on trucks fitted with doughnut tires.



Small Car Equipped with Doughnut Tires Similar to Those Used on Airplanes



Hydraulic Press That Turns Sawdust into Bricks Like Those Shown Above, for Fuel

## SAWDUST TURNED INTO FUEL IS CLEANER THAN COAL

Bricks made from sawdust without any binder have been introduced by a western firm for use as fuel. The sawdust is compressed in a wheel seven feet high, having forty-four holes the size of the bricks near its circumference. Each five-pound brick is said to have the thermal efficiency of three and three-fourths pounds of coal, and the fuel is much cleaner to handle.

## RADIUM TESTS STEEL IN SHIPS OF UNITED STATES NAVY 9/18/31

Defects in steel and other metals used in ships of the United States navy are being revealed through the use of radium. The research department of the navy recently purchased \$30,000 worth of radium for testing ship metals after the discovery of serious defects in several new cruisers. Radium produces a ray known as "gamma," capable of piercing the heaviest armor plate. Otherwise invisible cracks and defects are recorded on a photographic plate.

Herald & American  
9/14/31  
Copyrighted material

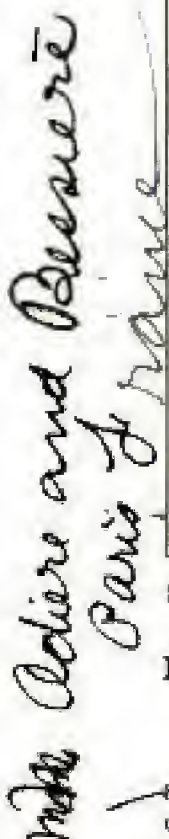
Goodyear Tire & Rubber Co  
Akron, Ohio

961  
9/18/49  
Chief  
Engineer, Potlatch Forest, Okla  
Idaho

Wood  
Bergmiller, Inc.  
Chicago

Science Service 9/12/31





## PLANE MOUNTED ON A RAIL CAR IMITATES FLIGHT

Dear Arthur  
 Much

ANSWERS

NY Times  
9/9/31

088

NG  
S  
ants  
ber  
nem  
e as  
be-  
B. F.  
om-  
ed.  
be  
nted  
ent  
l to  
inal  
olu-  
t of  
with  
C.

hold the shape and color of the original foliage. Trees are sprayed with the solution. After replanting, the expansion of the plant or tree, when it resumes growth, causes the rubber to crack, curl and fall off, the shrub then "being on its own" in the normal manner.

GI  
Q1131

It is Made from an Automobile Radiator R

Richard Steiff  
Jackson, Mich



# MENTAL MAGIC

**F**EATS of divination have long been among the most pleasing phases of magic. While the effect in every case is based upon pure trickery, the clever performer can often, through a subtle use of pseudo-science, mold the spectator's mind into such a receptive mood that the effect becomes something more than a mere trick.

However, forgetting the scientific hallyhoo, how's this? The performer exhibits an ordinary alarm clock. He requests a spectator to set the minute hand at any number. The performer then takes the clock and, without looking at the face, announces the selected number.

It's really too easy. You prepare the time-piece beforehand by set-



ting the long hand at 12 and then making a vertical arrow mark across the stem which sets the clock. This arrow, cut in with a knife, should be scribed as lightly as possible consistent with visibility. You must remember, however, that, being on the reverse side, the arrow will point to the right for left-hand numbers and to the left for right-hand ones.

If you take a lump of sugar and make a pencil mark on it, the impression of the mark can be transferred to your finger tip by pressing the tablet with the moist forefinger. How about having a spectator mark some tablets with numbers. These are placed, marked side down, on a table. The spectator selects one, notes the number and hands it to you,

How the Performer Tells the Number on the Clock's Face, and How Numbers on Sugar Reveal Themselves



a1261



number down. You drop the sugar into a glass of water, let it dissolve, and then announce the number. Of course, the imprint of the number, reversed, would have come off on your finger which should be previously moistened.

Here's another effective feat which actually works itself. The performer exhibits three small cards, each inclosed in a small envelope. One card is red, another black, and the third blue. A spectator shuffles the cards and places them in the envelopes. Nevertheless, the performer calls out the color of the card in each container.

Simplicity again! Of the three cards, the red one fits the envelope closely, the blue one is one-thirty-second of an inch narrower than the envelope all along, and the black is cut on a slight bevel to fit perfectly at one end and taper about one-thirty-second inch at the other. These slight variations are quite unperceivable to the eye, yet can be easily "spotted" by squeezing the envelope between the fingers and thumb. This is done casually as the hand travels to the forehead for a lit-

tle "color radiation." Here's an excellent stunt with cards.

The performer takes a deck of playing cards and hands them out for shuffling. They are then put inside a hat and covered with a napkin. The hat may be thoroughly shaken. Despite all this the performer reaches inside the hat and removes ten or twelve cards, one at a time, announcing the name of each before it is withdrawn.

Ten or a dozen cards are memorized in order and held together with a paper clip. These cards are secreted up the sleeve. When the performer reaches under the napkin and into the hat to remove a card, he is actually busy taking the cards from his sleeve. After that, it is a simple matter to run through the memorized packet and name them.

The next little conceit has to do with a typewriter, and while it involves some preparation, it is quite mystifying when well performed. Like this: The wizard casually jots down a se-



Telling the Color of Cards in Envelopes, Above, and the Mystifying Trick of Naming the Deck

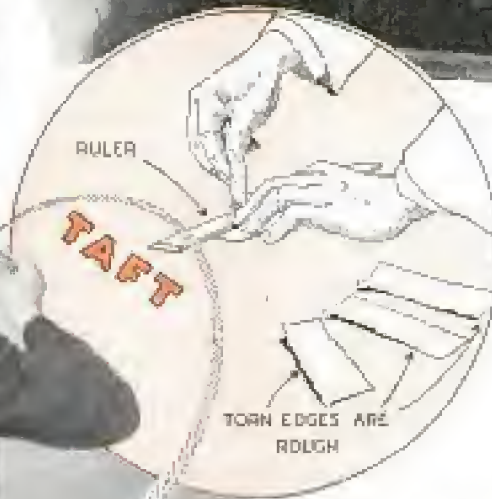
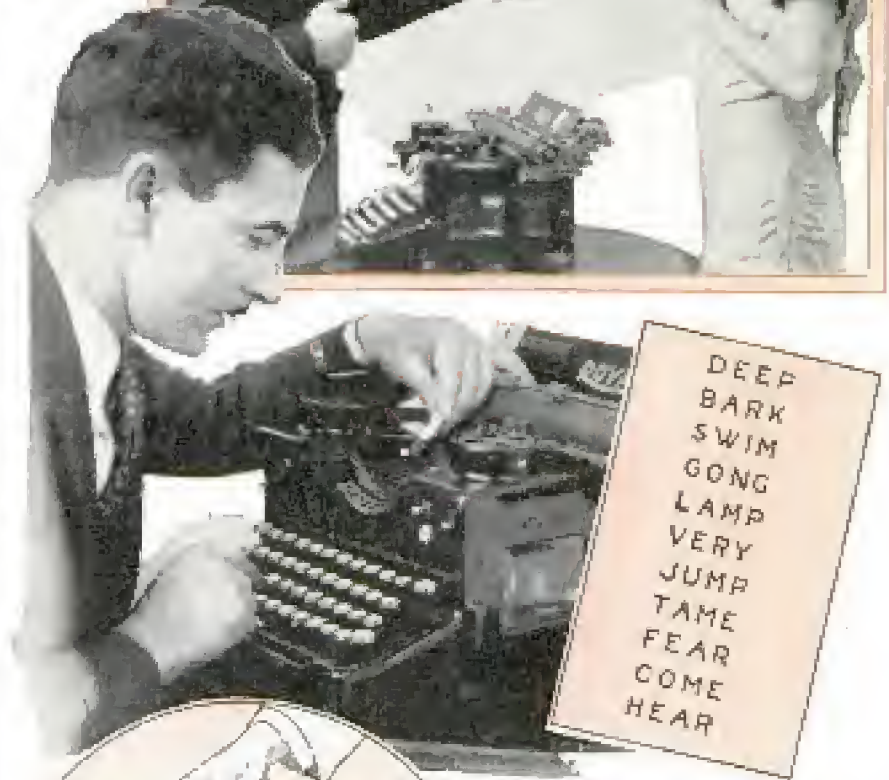


Q1261

ries of four-letter words on a slip of paper. This list is handed to a spectator with the request to select any word and write that on the typewriter. He does so. He removes the paper. The performer inserts a second sheet. His hands hover the keys as he strives to locate the "sympathetic" physical attraction and then—there it is—he is writing the selected word on the second sheet.

A piece of chalk accounts for the mystery. Notice that the list of words contains no two which start with the same letter, nor do any of these initials appear in any other word.

If you limit the list to the first five, you have the initial letters d, b, s, g and l. The typewriter keys representing these five letters are gently touched up with chalk. The doctoring is scarcely visible and is never noticed. If the word "deep" is selected, the spectator's typing of this



will cause the chalk mark to disappear from the D-key. You let your eyes roam over the keys and detect the letters not chalked.

One of the most popular effects is the "dead person" test. In this, the performer distributes a number of paper slips among the audience, re-

questing each person but one to write the name of a living person on his slip. The odd spectator is requested to write the name of a dead person. The slips are dropped into a hat. The performer may be blindfolded, yet he picks out the "dead person" slip, the others, as he puts it, "feeling much warmer" in contrast.

If you tear paper using a yardstick or ruler, the torn edge is rough. That accounts for the whole mystery. You use a



The Ghost Typewriter Tells What Word Was Written on It, and the "Dead Man" Trick



long slip of paper with four smooth edges. Tearing off from this, the first slip will have three smooth and one rough edge, while the others, barring the last slip which is not used, will have two rough edges. The person receiving the smooth-edged slip is requested to write the dead person's name; the others write the names of living people. The smooth-edged slip is easily detected by touch.

### FISHING AND HUNTING VEST CONTAINS WIRE CREEL

For the use of both hunters and fishermen, a combination jacket is now being

*Creel Jack*



Jacket for Hunters and Fishermen; the Compartment at the Back Contains a Wire Creel

offered that contains a built-in creel as well as a pocket for game or equipment. The garment is sleeveless and the creel, in the form of a large wire basket, rests in a pocket at the back. This pocket is waterproof and the creel and its compartment can both be washed.

### STEAM PLANT FOR AIRPLANES NEARS A TRIAL FLIGHT

In an effort to develop an airplane power plant more dependable and economical than the gasoline or Diesel engine, a Cleveland manufacturer is building an experimental steam-driven plane. Work has been in progress more than a year and leading metallurgists have co-operated in

producing parts of sufficient strength combined with the necessary lightness and many new alloys have been adopted. The power plant is of the turbine type, having a closed water and steam circuit, forced feed and a condenser. Its backers claim the plane will have an emergency radius of more than fifty miles as a result of reserve power in the steam plant, so that emergency landing hazards will be at the minimum. Bunker fuel oil is to be used, while fewer parts and lower operation and maintenance charges will produce marked economies, it is expected. Since the turbine is practically vibrationless and produces no electrical disturbances, radio interference will not be present. The motor is to produce 2,350 horsepower, and heat from the steam can be utilized to make the cabins comfortable.

*a1810*

### COPIES MADE ON TYPEWRITER WITHOUT CARBON PAPER

From one to four copies and the original can be typed simultaneously on a typewriter without the use of carbon paper by attaching a frame containing ribbon strips to the carriage of the machine. There are two of these ribbon strips secured to a double-armed plate. If only one or two copies are wanted, a guarded ribbon which duplicates on only one side is used. If more than two copies are required, double-sided ribbon strips are employed, each ribbon making one copy on the front of one sheet and the second on the reverse side of another. If four copies are wanted, two must be made on this paper as the typing is read through the paper, while the two others may be made on paper of any thickness. Two levers operate the ribbons, bringing them between the sheets in proper position for writing after the paper is inserted in the roller. The ribbons are less expensive than carbon paper and involve less work.



### *a1876* STEAM PLANT FOR AIRPLANES NEARS A TRIAL FLIGHT

In an effort to develop an airplane power plant more dependable and economical than the gasoline or Diesel engine, a Cleveland manufacturer is building an experimental steam-driven plane. Work has been in progress more than a year and leading metallurgists have co-operated in

*Cereal Lakes Aircraft Corp. 16800 St. Clair Ave Cleveland Ohio*

*The Copy Graph Corp. Chrysler Bldg New York*



Cum Everett Spring Q 1916 Coventry Saloon  
1929 N. Capable EAR MECHANICS bald car. 967  
Washington Lee

## ROMANCE OF MAHOGANY IN TARIFF RULING

Hidden behind a recent federal trade-commission ruling, dismissing proceedings designed to prevent labeling a wood produced in the Philippines as "mahogany," is a romantic history of the wood dating from its discovery in the sixteenth century. Meanwhile forestry authorities announce that the Philippine supply of the rare timber promises to be inexhaustible. Grown on American territory, produced by modern methods and machinery and imported without duty, it is used here for the manufacture of fine furniture and boats. The history of mahogany dates back to 1521, when Spanish and other explorers employed the wood for making canoes and for ship-repair work. Sir Walter Raleigh remarked on "its great beauty, hardness and durability," when on one of his voyages to the West Indies it was necessary for him to make repairs to his ship. From 1850 to 1905, most of the mahogany used in furniture in American households came from San Domingo, Cuba, Central America and Africa, and then also from the Philippines.

## AUTO IS BUILT TO BRING BACK WORLD'S SPEED TITLE

Streamlined to a high degree and powered with two 1,500-horsepower engines will be the racing automobile which Harlan Fengler, American driver, is building in an attempt to recapture for the United States the world's straightaway speed record now held by Great Britain. His model is constructed to a scale of one to eight.



Model Shows Streamlining of Racing Automobile Which Is Being Built for an Attempt to Break World's Speed Record



Automobile with Doors Which Lock Together, Eliminating the Center Posts; Note Sliding Panel in Roof

## CAR DOORS OPERATE TOGETHER TO PREVENT ACCIDENTS

One of the body models of a small English automobile is unusual in that it contains no center posts to which the four doors may be fastened. Instead, the two doors on each side lock together, making it impossible for a rear door to swing open without the knowledge of the driver as the front door opens at the same time. The car also has a sliding roof, virtually converting it into an open model for good weather. The rear doors are cut out to clear the wheels and fenders.

## PLOW FIGHTS FOREST FLAMES BY CUTTING TRENCHES

Fighting forest fires in Oklahoma has been made easier by the use of a plow which cuts wide furrows from which backfires may be started. The plow, which is a combination of a tractor and "middle-buster" plow, does a day's work of ten men in two hours, clearing a four-foot space two miles long in that time. The tractor motor provides sufficient power to enable the plow to travel any ground an army tank could negotiate.

Oklahoma  
Forest Service  
Copyrighted material

shown at motor show at Olympia  
London, England

9/19/21  
U.S. Navy

U.S. Navy





# BIRD

It is every man's opportunity, and some practical suggestions follow on how to save lives and get a lot of fun.

The good Samaritan must first recognize two groups of winter birds. The first is made up of the happy-go-lucky, friendly fellows who will come cheerily around the home, sit on the porch, and play in the back yard. These include the chickadee, nuthatch, bluejay, downy woodpecker, cardinal and others. In the second group are the quail, pheasants,

**T**HE assurance that a well-fed bird rarely, if ever, dies of cold, makes thousands of sportsmen, home owners, farmers and boys and girls turn each year to the important sport of winter feeding to provide meals, life, and warmth for game and song birds which do not migrate to warmer climes.

Providing food for birds—either around one's home, or on a farm—is much more than a sport. It is a conservation measure that helps the farmer and the sportsmen and assures the future of game and song-bird life.

The feathered residents become tamer in winter because they are hard pressed for food. It is a simple matter and not expensive to feed the winter birds. No elaborate or costly equipment is necessary. No large sum of money is required.

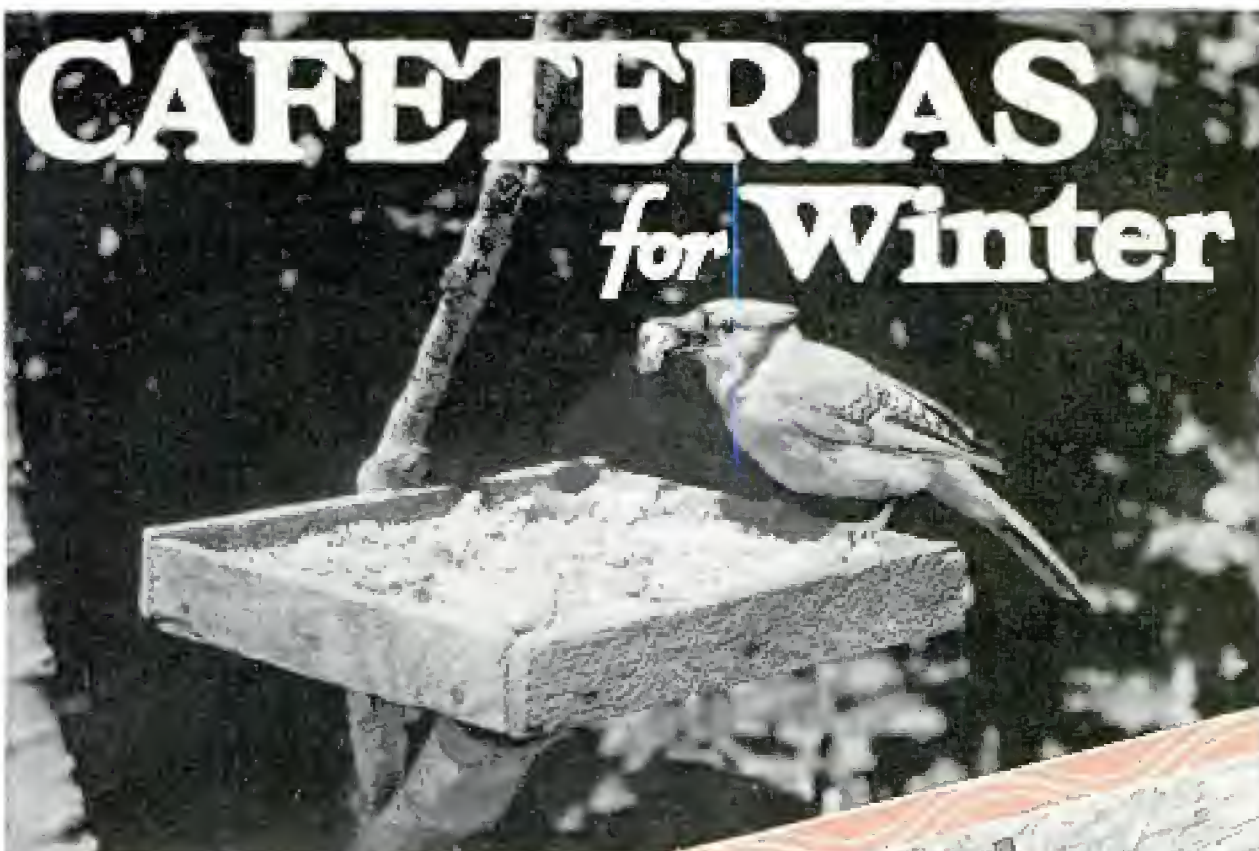


The Chickadee Above Became Very Friendly around a Feeding Station; an Elaborate Food Station for the Yard, at Left



Woodpecker at a Suet Hopper Getting a Free Meal





Hungarian partridges, occasional doves, and other birds that spend their winters on farmlands outside of village, town and city. These are wilder and must be helped in their natural haunts.

The spectacular stunts, such as scattering loose grain from an airship, are generally ineffective. The grains sink rapidly into the snow and are soon out of sight and reach. Feeding must be maintained over long periods to be effective.

The staples in the winter food kitchens should include seeds, bread crumbs, nuts, and some fat, like suet.

The time to begin your outdoor cafeteria is not late in the fall but the very first day in November. Begin early and continue the feeding until March. Regularity of supply is very important.

Here is an inexpensive way to make a suet container. Take a common wire soap shaker, fill it with suet and suspend it from a line in a tree. The crow and the pestiferous sparrow, which do not like to feed from a swinging object, will leave it alone.

With a few boards, hammer, nails and a saw, you can build a simple food shelf near a window so that you may watch your feathered boarders. A slanting roof



Bluejay at an Extremely Simple Winter Station, Made from a Couple of Boards and Four Pieces of Lath; Suet-Feeding "Shakers" Can Be Hung on a Line with Snaps or Clothespins



21693970

## POPULAR MECHANICS



is recommended. The shelf may be fourteen by twenty inches, or larger, and should have a lath tacked around the edges to keep the food from blowing away. Leave drainage holes in the bottom and at each end and cover them with screening. Nail a stick, fifteen inches high, to the floor and attach a small wire hopper full of suet. On the other side, drive a few nails, leaving part of each exposed so that you may hang apples, meat bones, bread, and similar foods, from the points.

It is quite easy to forget the birds which do not come near the house.

There are the bobwhites, the pheasants, meadow larks, doves, and others, that stay in the fields and thickets.

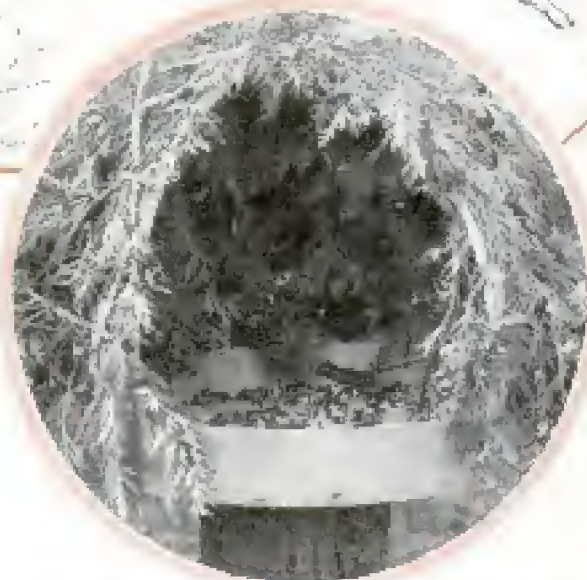
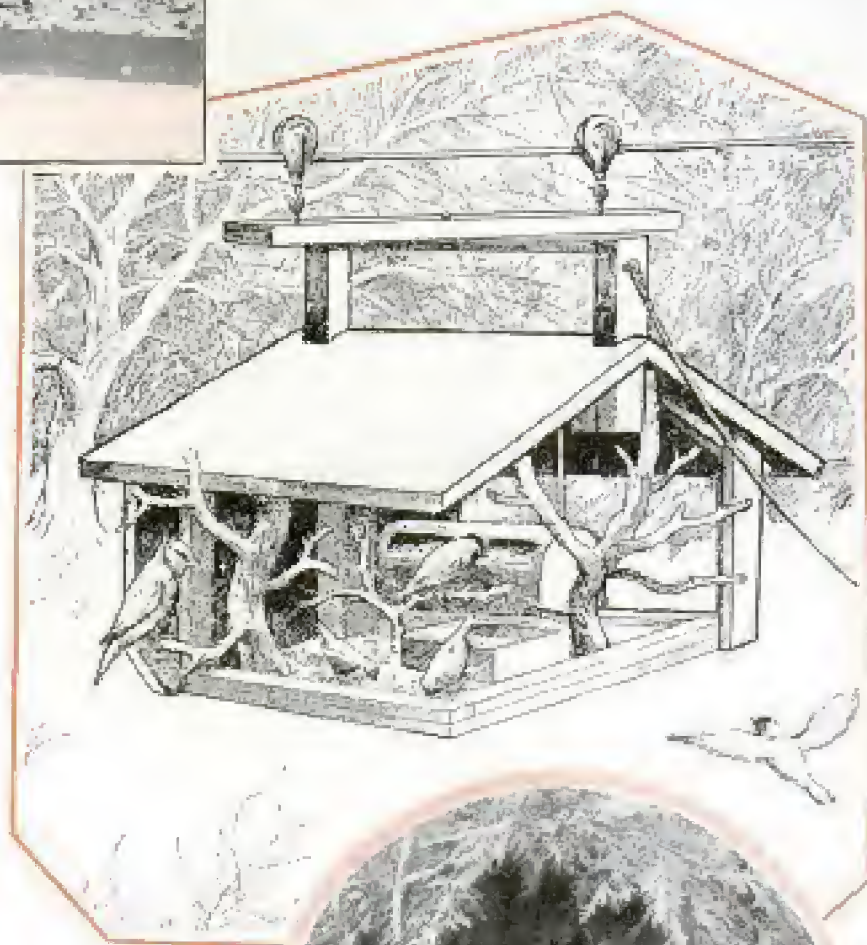
A severe winter, especially if sleet storms occur, makes it unusually difficult for game birds to sustain life. Here is the way to set outdoor cafeterias for them.

If you are going to feed cracked corn, buckwheat, barley or chaff, clear away the snow before scattering it, and make a windbreak to keep the snow from covering the food. Open-pit feeding is to be recommended for Hungarian partridges and field birds, such as the snow buntings, longspurs, and most upland game birds who will go some distance from their cover.

It is not so effective for quail. In this case, it is much better if you locate the coveys, if you can, and distribute the

grain near by. For quail, shelter feeding is particularly recommended.

The shelters should be large enough and placed with the needs and habits of the birds in mind. Arrange the brush or stalks in the form of a tepee and face it away from the biting winds. Leave open-



Suet Should Always Be Placed inside Wire Netting, at Top; Trolley-Car Food Station, Center, and a Station Made from Cheese-Box Cover

ings so as not to make a trap of it. Leads of grain may start at some distance from the shelter and run directly to it. Having once found it, the birds will remember the food station.



Carl Amos Hodde,  
Mornview,  
Santa Paula, Calif.

91893

## STEAM HEATING OF ORCHARDS TO SAVE FUEL 1964

Steam heat, delivered by overhead irrigation, may banish smudge pots from California citrus orchards if winter trials prove successful. The new system, with slight alterations to provide revolving steam outlets, will be fed from a central power plant. The outlets, placed under the trees, not only will send steam-heated air through the foliage, but will supply a constant, warm draft through the orchard as well. Considerable saving in fuel and in labor charges incidental to tending the smudge pots is expected, while the air will remain free of soot that is given off by the pots.

## U. S. POPULATION CENTER STILL MOVES WEST

Steady movement west of the center of population of the United States is recorded by latest census figures, showing that the shift in the last ten years has been 22.3 miles west, and 7.6 miles south. This places the center of population in Stockton township, Greene county, Indiana, near the town of Linton. Since 1790, various influences have affected the nation's population. Cattle, wheat, oil, real-estate booms, resorts, motion pictures, minerals, cotton, fruit and national defense—all these have had a hand in "jiggling" the census gauge. In 140 years, the advances of population bulk have totaled 589 miles, mostly westward and a trifle southward, according to a bulletin from the National Geographic society, which points out that the rate of movement has been approximately three miles per year, following principally along the thirty-ninth parallel of latitude.

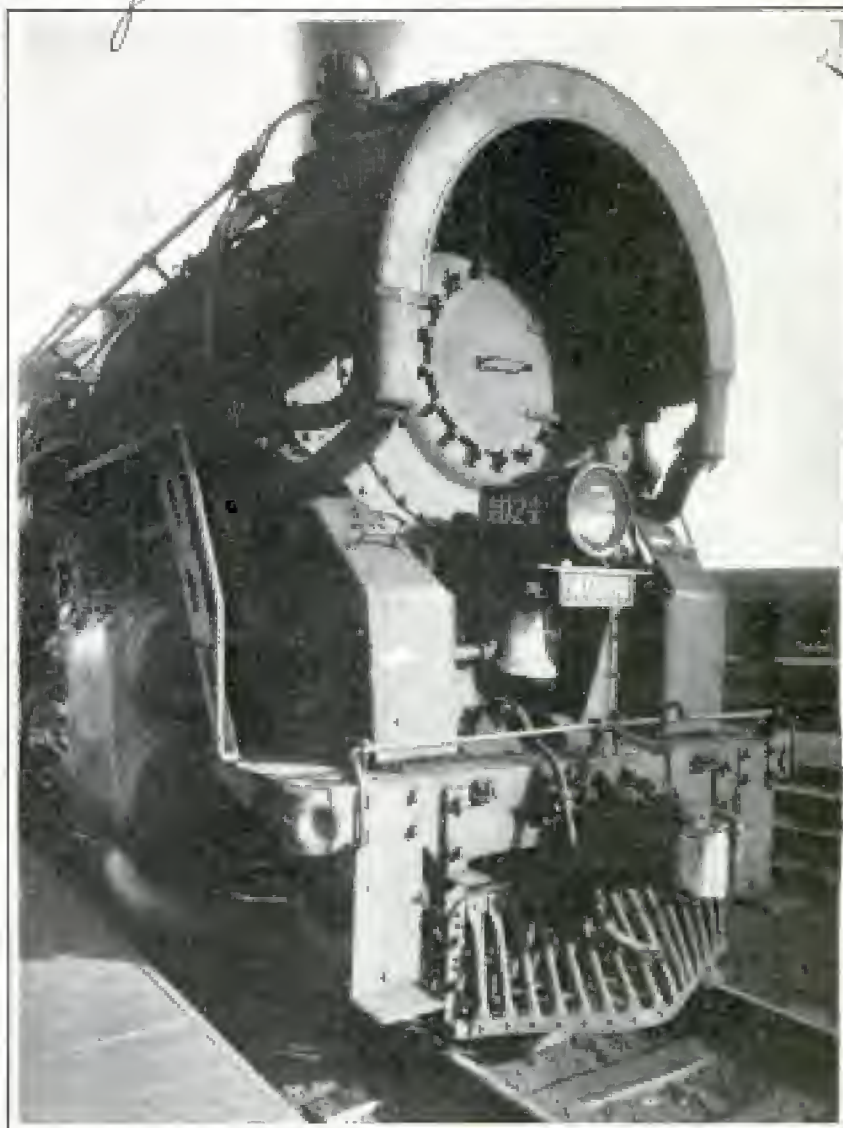


Photo Erving Gallaway  
Freight Locomotive That Wears a Bonnet Which, in Reality, Is a Water Heater; Note the Position of the Bell and Headlight

## LOCOMOTIVE WEARS A BONNET TO HEAT ITS WATER

Several innovations in engine design are incorporated in freight locomotives recently purchased by one eastern railroad for use in hauling heavy loads over the mountains. A front view of such an engine shows a projection like a hood or bonnet extending out over the boiler. This is a feed-water heater which was moved to the front because of changes in the position of the main throttle valve. In a recess above the pilot, the bell and headlight also are found, instead of in their usual place on top of the boiler. Engines of this type weigh more than 300 tons, are 100 feet long and develop 3,400 horsepower. They carry 18,000 gallons of water and twenty-four tons of coal.

Lima Locomotive Works  
Lima, Ohio.  
used by Dorsch's main RR

Geographic News  
Bulletin 2094.  
9/25/31



Riverside Orchard Co

972 Edgerton

POPULAR MECHANICS

FRUIT BAGGER HOLDS THE SACK  
FOR EASIER HANDLING

1918

\$ 25.00

Apples and Other Fruit  
or Vegetables Are Easily  
Sacked with This Ma-  
chine Which Holds the  
Bag to Be Filled



Easier handling of apples, potatoes, or any fruit and vegetable that can be sacked, is made possible by a bagging stand which holds the sack while the fruit is being emptied from another container. This equipment is padded to prevent bruising, and the sack may be raised or lowered to settle the fruit. Paper bags, holding one-half or a full bushel and fitting into the buyer's auto without injuring upholstery, are used instead of the old-style basket.

CLICKER ENDS ANIMALS' FEAR  
OF CAMERA NOISES

Wild animals' fear of the camera's click has been dispelled by an invention which has only one use—that of getting jungle life accustomed to the noises attendant on filming of the wary beasts. This invention, placed in the film party's blind, clicks away hour after hour while the camera operator watches. As the animals grow accustomed to the sound, they soon lose their fear and venture within range, there to be filmed in their native haunts. Formerly, when the camera started clicking, the animals would turn tail and flee.

no information  
as to maker or  
inventions

Bureau of Soils, U.S. Dept.  
of Agriculture

Washington, D.C.

even after the operator had waited pa-  
tiently for days, or perhaps weeks, for the  
right moment.

SAFETY WINDOWS PREVENT  
DUST EXPLOSIONS

Safety windows, hinged to "give," may be the means of preventing in the future many explosions in grain elevators, flour-mills, and like places, from dust. It has been discovered that almost invariably there are three distinct blasts in such disasters, the first being slight, but sufficient to shake down more dust, causing a second heavier explosion, and finally a third that may shake or destroy the entire building. Windows so installed that pressure from the inside will cause them to swing outward, will confine the first blast to the room in which it occurs by providing a "safety valve," it is argued.

IRON ROADWAYS RESIST WEAR  
OF HEAVY TRAFFIC

Iron-plated roads are being constructed in London to cope with the increasing heavy traffic on streets near the docks and on arterial thoroughfares. The iron roads are constructed of triangular cast-iron slabs, each stamped with truncated pyramids. They are laid on a concrete



London Street Surfaced with Slabs of Cast Iron to Resist the Wear of Heavy Traffic

Manager Iron Roads  
Marble Hall  
Clybankment  
Vauxhall  
London E.C. 4

Emil H. J. Wilkins

Collins 9/12/31

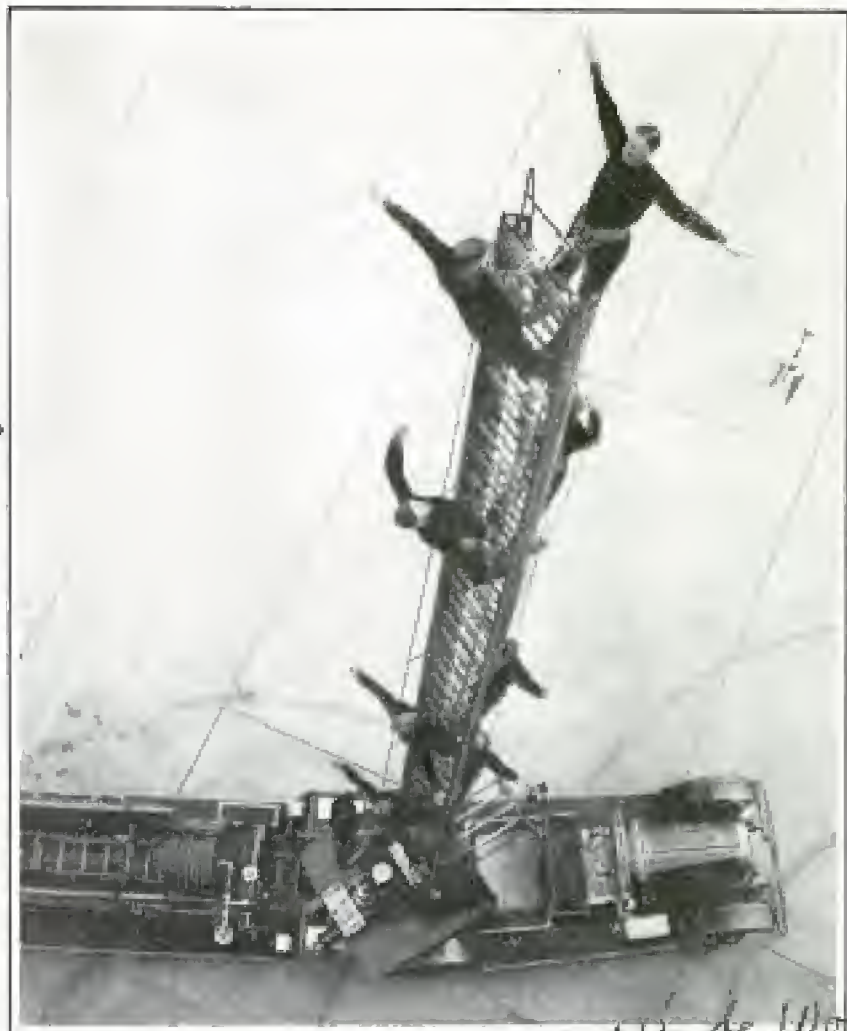


foundation and are spaced half an inch apart, the apertures being filled with a tarry substance to allow for expansion and contraction. White traffic lines, consisting of detachable plates, can be incorporated in these streets, some of which carry traffic amounting to 80,000 tons a day.

### FLYING DEATHS REDUCED BY HALF

In more than 20,000,000 miles of scheduled air-transport flying during the first six months of 1931, there were only five accidents involving fatalities, and in these only three passengers were killed. As compared with the corresponding period of 1930, when passenger-miles flown per passenger fatality were 2,375,664, the passenger-miles per fatality in 1931 were 5,277,989, due both to an increase in miles flown and a decrease in passenger deaths. Miles flown in scheduled operations in the first half of 1930 were 16,902,728 and, in the same period of 1931, the figure was 20,304,430, while passenger fatalities decreased from twenty-two in 1930 to nine in 1931. The total number of accidents of all kinds increased in the 1931 period, and although the number of miles flown was greater this year, there was a decrease in the number of miles flown per accident. In the first half of 1930, there were forty-four accidents, making the number of miles flown per accident 384,152, while this year there were sixty-one accidents, or one for each 332,860 miles. Causes of accidents during the first half of 1931 rated as follows: material, 40.08 per cent; miscellaneous, including weather, darkness, airport or terrain, 32.31 per cent; personnel errors, 25.15 per cent, and undetermined and doubtful, 2.46 per cent.

*Dept. of Commerce.  
Aeronautics Branch*



Recruit Firemen Exercising on an Aerial Ladder to Accustom Themselves to Clinging to the Lofty Perch without Using Their Hands

### CLIMBING LADDERS IS TRAINING FOR FIRE FIGHTERS

Recruit firemen at the Detroit training school go through an intensive course during which they must become proficient in climbing ladders, jumping into nets and effecting rescues from tall buildings. One of the stunts consists in doing calisthenics at the top of an eighty-five-foot aerial ladder. In such exercises, the recruits hold to the ladder with only their feet and legs, leaving the hands free and thus becoming accustomed to the lofty perch and experts in clinging to it without the aid of the hands.

Popular Mechanics Magazine does not publish the name of the maker or seller of any device described in its pages, but this information is kept on file and will be furnished free upon application to our Bureau of Information.



# Undersea Acrobats the World Never Views



Courtesy The Illustrated

Gymnastic Exercises Divers Must Go Through on Their Way to the Surface, to Decompress Themselves. Are Shown across the Pages; Many of Their Activities Are Never Considered by the Public



# and "Slow Motion" Jumps on Ocean's Floor

*ascending to accelerate Expulsion of Nitrogen from his body.*



Regulating air valve & adjusting body position hanging on by the left hand.



Backward swimming swimming body & legs.



Hanging on by left leg & exercising.

*Using an Oxy Acetylene Cutting Torch under Water.*



Making flame.

*The appearance of a Diver when subjected to great Water Pressure.*



Upper portion of suit partly inflated to relieve pressure on ribs.

Lower portion of suit pressed tight against body by the water pressure.

Mind rising to clouds.

*Diver emerging from tunnel bored by Water Jet under Wreck.*



Water Jet.

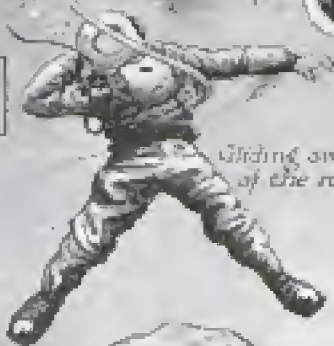
Diver's telephone lines & air pipe.

Wreck.

Wrecked & Submersible Diver.

Tunnel under wreck.

*Jump Sea.*

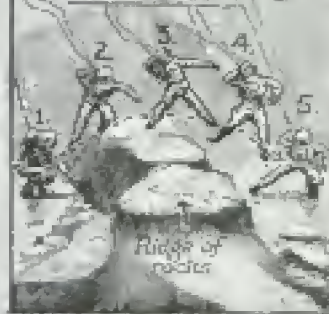


Gliding over the top of the rocky obstacle.



Gently landing on the underside of the jump.

*The Diver's "High Jump" diagrammatically illustrated.*



G. HAYES 1927.

London News

8/22/31 P. 286-7

The Undersea "Slow Motion" Broad Jump Sometimes Is Necessary to Get over Rocks and Other Obstacles; Tunneling under Wrecks Is One of the Divers' Most Hazardous Undertakings



London Express

Mr. Elsie McElmala

976  
a1797

8/19/36

POPULAR MECHANICS

WIRE ROLLS TO STOP BANDITS  
FLEEING IN AUTOS



How Coils of Loose Wire Are Employed to Stop Fleeing Auto Bandits

Developed primarily for army use, Great Britain has found an effective road barrier for stopping fleeing auto bandits in nothing more substantial than a roll of light wire. The wire coils, about four feet in diameter, weighing less than fifty pounds and stretching about sixty feet, were found to block roads so swiftly that armored cars and trucks were stopped dead in their tracks. The roll of wire is known as a "fence concertina" and is stretched across the road at a point where it is desired to stop a car. The secret of its efficiency lies in its ability to tangle. When a car runs through it, the coil stretches and then breaks, the loose strands twisting about the wheels, winding into the steering gear, working into brake drums and around axles and usually finishing the job by completely jamming the engine.

NEW DRUGS FROM KEROSENE  
REWARD RESEARCH WORK

Hitherto unknown substances, believed to contain valuable medical properties, have been found in crude kerosene. These products, different from anything ever obtained from a natural source, are classified as hydro-aromatic bases, in which are

Mr. J. R. Bailey Prof.  
Organic Chemistry, Univ. of  
Texas, Austin, Texas

included such well-known plant drugs as quinine, morphine, cocaine and strychnine. Heretofore, the plant kingdom alone has furnished this type of substances, known as alkaloids. The breaking down of complex molecules in the refining process of crude oil results in the alkaloid products. They differ from plant alkaloids in that they contain no atoms of oxygen. No one can foretell how far this, and other slight differences, may go toward producing important effects upon disease. An advantage of the petroleum alkaloids is that they can be distilled and thus highly purified. Tests of the substances were made at the cancer-research institute of the Pennsylvania university.

Philadelphia  
GYPSUM AS A FERTILIZER

Gypsum from Nova Scotia is used in large quantities as a fertilizer and moisture retainer in the peanut-growing districts of Virginia. Large deposits of this mineral are found not only in Nova Scotia but in several other Canadian provinces. In addition to its use in growing peanuts, gypsum is employed, when calcined, for making dental and hard wall plasters.

Canadian Government  
Bureau of Statistics

ROAD MAP SHOWS DISTANCES  
ON SLIDING CHART

Distances from any designated point to any other point are shown automatically on a road map which consists of an envelope, on the face of which the map appears, and a sliding chart fitting inside the envelope. Beside each town designated on the map is an opening through which figures on the chart show. To reveal the distance from one city to all others, the chart is moved until the name of the starting point appears in a slot at the right of the map. The figures in the openings then show the distances to each of the towns on the map.



To reveal the distance from one city to all others, the chart is moved until the name of the starting point appears in a slot at the right of the map. The figures in the openings then show the distances to each of the towns on the map.

A. McLay & Co Ltd  
Cardiff, England.

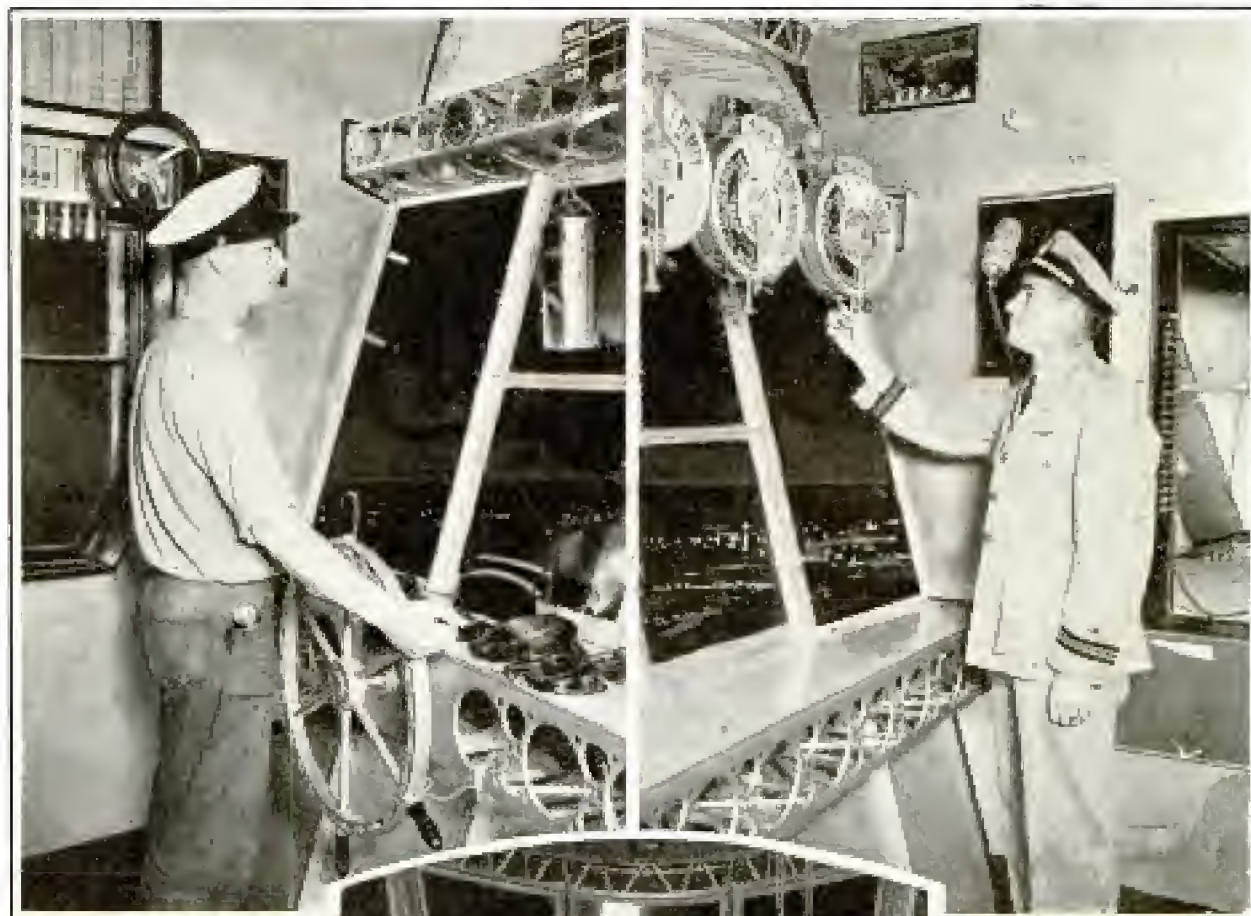
Chel. Montague

No. 11 agent known

Copyrighted material



# Navy's Air Giant Handles Easily as a Yacht



When the "Akron" recently cruised over north-eastern Ohio on her maiden trip of three hours and forty-seven minutes with 113 passengers aboard, she handled "like a yacht," according to officers. The pictures on this page show the three principal control compartments of the giant ship. In the upper left is seen the elevator controls which cause the vessel to point upward or downward by moving the giant horizontal elevators more than 600 feet



The "Eyes" of the Dirigible "Akron"

away, at her stern. These controls, of course, are exclusive of those regulated by ballast or gas. In the upper right photo Lieut. Comm. Bertram G. Rogers of the navy, engineer officer of the "Akron," is operating the engine telegraph levers through which orders from the control car are transmitted instantly to the eight engine rooms. At the bottom is the steersman who governs the ship's course. This wheel moves the vertical fins and guides the ship to the right or left.



2 1894  
978

John Edwin Hogg,  
Box 458,  
Alhambra Calif



Fireman in Asbestos Suit and Helmet Walking through Flames as He Sprays Carbon-Dioxide Gas on Blaze

## FIREMAN IN SUIT OF ASBESTOS WALKS THROUGH FLAMES

Firemen of Los Angeles have been provided with suits of asbestos in which they penetrate into the heart of a blaze without injury. Those wearing the fireproof suits attack the flames with carbon-dioxide extinguishers, spraying this gas directly into the blaze and thus smothering the flames at their source. The asbestos suits cover the entire body from head to foot, the top comprising a hood in which there is an aperture through which the wearer can see.

## SNAILS TEST WATER

Just as canary birds can detect the presence of poisonous gases in mines, snails are being used by mineral prospectors in the southwest for testing the

safety of water supplies obtainable from isolated water holes. Such sources of supply seldom are contaminated with disease-producing bacteria, but frequently contain poisonous minerals. Snails are very sensitive to contaminated water and die very quickly in it. Prospectors now carry a few snails in a bottle of water and when doubtful of a water hole, they take a sample and drop a snail into it. If the snail survives for half an hour, it is almost certain that the water is safe for drinking.

## HAY DRIED ELECTRICALLY LATEST ON FARM

Green hay is chopped and dried, independent of the weather, by electrical equipment being used on farms in the United States. The hay is mowed in the usual way, then carried to an electric-motored chopper, which cuts the hay into one-eighth-inch lengths, and electrically conveyed to the hopper on top of the drier. The short green hay is fed into the drier, mixed with hot gases and the moisture driven off at temperatures of 1,000 to 1,500 Fahrenheit. A large exhaust fan pushes the mixture through three cylinders and finally blows the hay into a separator. Here the dried hay is collected and placed in the mow or storage bins. Retention of valuable food properties is among the advantages of the drying equipment, all of which is operated by electric motors.



Rain or Shine, This Electric Dyer Makes Hay, Doing in a Few Minutes What Takes the Sun Days

Arnold Dryer Co. Milwaukee  
on Ashgrove Farms  
3000 W. Montana

suggest F. D. Garrison & Co.  
209 S. Dearborn Chicago

near Sacramento, Calif.  
Dyer - 103 Ashgrove

2 1916

Arnold

Copyrighted material



91765 Cont John W. Harrington  
220 W. 42nd New York

# World's Tallest Hotel

## Built on Stilts over Railway

**B**UILT over a railroad yard and yet free from noise, jar, smoke, soot and dust, stands the new Waldorf-Astoria.

While it was being erected, express trains moved over its site. Since its opening, they glide among the steel stilts between the tracks which hold its strange



foundation. Here is a hotel providing comforts and luxury for thousands, and yet without cellar, coal bunkers, furnaces, boilers or electric plant. It was made possible by stunts of engineering ingenuity: its operation defies tradition.

The old Waldorf-Astoria was sold in 1928 to make room for the Empire State building. At that time, the owners served notice that the hyphenated title was protected by trade-mark. Finally a new organization was formed and the land on Park avenue acquired on which now looms this \$38,000,000 hotel.

Site of New Waldorf-Astoria Hotel with Skeleton Outline of Building Imposed

First came the removal of the buildings which occupied the site. More than 1,000 men were set to work in the underground realm stretching from Forty-third to Fiftieth streets, to reroute enormous pipes and conduits, and 400 electricians shifted twenty miles of cable. All of the work had to be done without discommoding the traveling public. No expense was spared in the placing of the giant legs which decided whether or not the hotel would be habitable. If the columns were





An Unusual View up Park Avenue, Showing the Waldorf-Astoria Hotel as It Now Stands Completed above the Railroad Tracks

not properly set, the rumble of the trains would be communicated to them and to the remotest parts of the structure. Hence each support rests on an anti-vibration mat. This device consists of a layer of sheet lead one-eighth of an inch thick; three-eighths of an inch of compressed asbestos; a layer of galvanized iron about the thickness of a postal card, and another one-eighth-inch plate of lead. All its materials vibrate a little as the trains go by, but at differing rates. The varied vibrations neutralize each other. Around the foot of each column is a cleared space which prevents any pulsation from the sides.

The hotel has 2,150 rooms. It has a plant whereby its climate is made to order—cool, warm, dry or moist. Beneath the structure is a spur of track to which express cars of supplies may be shunted. Private parlor cars may be switched there also, so that their owners may go directly to rooms in the hotel.

The roof garden is another of the mechanical marvels of the place. Its floor is the first setback, eighteen stories high. Two hundred feet long, it is covered with an ornately designed lattice, through the open work of which you may gaze at the blue vault of the star-studded sky on summer nights. If rain should suddenly come, a steel and glass skylight, apparently moved by magic and coming from nowhere, slides noiselessly over the garden.

Although it burns neither coal nor oil and gets its heat from outside, the Waldorf-Astoria can warm up a cold room in two or three minutes. Its radiators, as the public will call them always, probably, are not radiators at all. They are convection heaters made of copper pipes to which are at-

tached fluelike appendages of the same metal. These get hot within a few seconds after the valve is turned; draw the air in at their bottoms, and send it heated out of their tops. They are hidden behind pierced screens under the window sills.

The elevator service consists of thirty-one units, capable of being run at high speed. It includes also a huge cab in which automobiles and motorboats can be taken to the grand ballroom for exhibition purposes.

As a structure, the new Waldorf-Astoria is 625 feet high, and contains 20,487,000 cubic feet. It has only 2,150 rooms, which is less than the number found in several leading American hotels, such as the Stevens (2,986) and the Palmer (2,243) of Chicago, but they are considerably larger than the average.

Forty-seven stories tall, the hotel uses twenty-eight of the stories for transient patrons, the upper apartments being reserved for permanent residents.





© Photopress Ltd.

Auto Equipped with Adjustable Roller to Take Up Road Shocks in Touring Wilds of Central Asia; When Rough Roads Are Encountered, the Roller Is Lowered and Absorbs Vibration

## ADJUSTABLE ROLLER FOR AUTO ABSORBS ROAD SHOCK

Automobiles composing an expedition touring the wilds of central Asia to make sound-picture films have been equipped with huge rollers to aid in negotiating the rough and dangerous roads that often are little more than paths. Each car has

one of the adjustable rollers installed in front of the bumper. When the going is rough, these rollers are lowered and absorb much of the shock in sudden steep drops, preventing the jolting and vibration from being transmitted to the mechanism. On good roads, the roller is raised above the road level where it is entirely out of the way.

## DIESEL ENGINES FOR TOWBOAT ADD TO POWER AND SPEED

Capable of maintaining a speed of twenty miles an hour, the "Herbert Hoover,"

the world's largest Diesel-powered towboat, recently was placed in service on the Mississippi river. The craft is 225 feet long, has three decks and cost half a million dollars. Power is supplied by two oil-burning 1,000-horsepower engines and the boat carries a crew of thirty-three. It will be used for service between St. Louis and New Orleans.



Towboat Powered with Diesel Engines of 1,000 Horsepower Each That Makes Twenty Miles an Hour

## SPRINGS OF RUBBER FOR AUTO A1956

A new type of automobile, now being built in England, will be almost entirely rubber-sprung, it is announced. Specially prepared rubber of high elasticity and endurance will be employed to dispense with metal springs. Trials of the car are expected within a few weeks.

Reported by Consul  
 W. St. John Newcastle  
 M. J. Gne, England



maker of umbrella  
unknown



Patrons Are Protected from Sun and Wind at Outdoor Tables by These Revolving Umbrellas with Side Curtains

### UMBRELLA WITH SIDE CURTAIN REVOLVES OVER TABLE

Umbrellas with side curtains revolve over outside tables at a Los Angeles cafe, to protect diners from sun and wind. The staff of the umbrella is set in concrete and turns on roller bearings. The side curtain is wide enough to cover forty per cent of the circle, and as the sun or wind moves during the day, the curtained umbrella is revolved to provide adequate protection. The device converts each outside table into a semi-private booth. Its use on lawns, beaches or other outside places has been recommended by the makers.

### FREEZING KEEPS RIVETS SOFT FOR MAKING AIRPLANES

Freezing to keep duralumin rivets soft until time for them to be driven in airplane assembly is a discovery by engineers of a western company. It has been found that if duralumin rivets are allowed to stand more than a few minutes after

heat-treating and quenching, they become too hard to drive satisfactorily. These engineers have found, however, that if the rivets are placed in freezing temperatures immediately after being quenched, this hardening process is delayed for as long as two weeks. "Dry-ice" containers holding the rivets are placed in a master storage box and from there distributed to smaller boxes in the various assembly departments requiring them.

91898

### MOTOR OIL IS REFINED WHILE ENGINE RUNS

Cleaning and refining of motor oil while the automobile is in operation is made possible by an improved filter which removes dirt, carbon, iron, copper and other abrasive matter. The filter actually refines the oil, its inventor asserts, through use of a secret compound which becomes active at a temperature of 210 degrees, generated by the motor. The refining process does not destroy the viscosity of the oil, but improves it by removing gasoline and acid dilutions, according to the inventor. Oil treated by this improved filter will op-

Refine Oil Filter



"Filter" Being Installed in Filter Which Cleans and Refines Oil as Auto Runs

Chas. O. F. Tibbets  
Los Angeles, Calif

Boeing Airplane Co.  
Georgetown, D. C.  
Seattle, Wash

Jam. O'Shanter cl m.

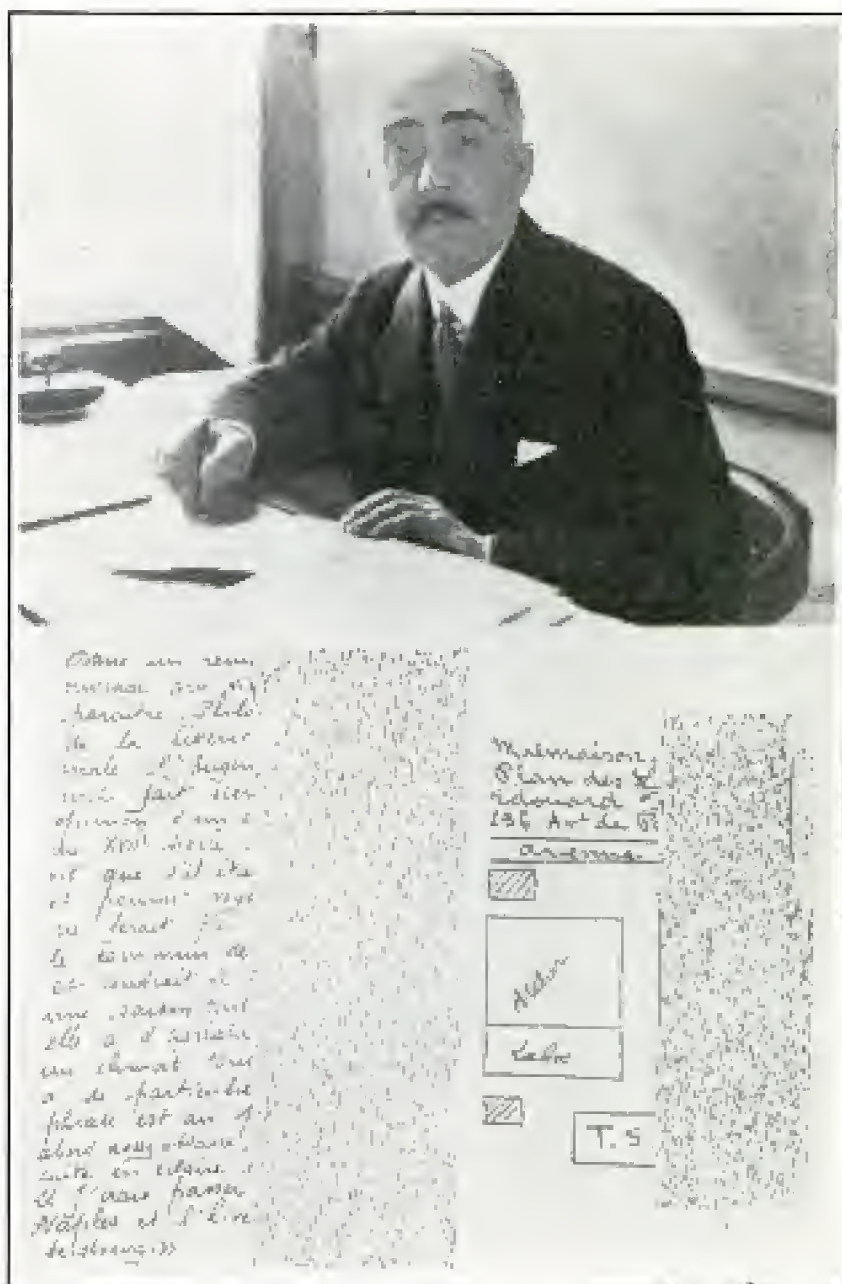
1616 W. 15th St.



erate satisfactorily in a motor for 10,000 miles, at which point both the oil and the secret "filler" must be changed.

## ELECTRIC EYE AIDS ORCHARDISTS ROUT PESTS

Oriental peach and codling moths, foes of the peach and apple crops, may be routed with the assistance of the photo-electric eye if experiments carried on by the New Jersey agricultural college prove successful. These moths cause much damage by laying their eggs on the trees in question, but they will not lay when the temperature is below 60 degrees or in the daylight. To defeat the moths, it was decided to floodlight some experimental orchards and have the light turned on and off by General Electric photo-electric relays. These devices are set to operate when the light increases or decreases beyond certain predetermined limits. When darkness approaches, the eyes note the change and cause the floodlights to be turned on; when daylight returns, the never-sleeping eyes turn the floodlights off again. The moths, finding a state of continual daylight are expected to be discouraged from their egg-laying in that particular orchard. As it is unnecessary to use the floodlights when the temperature drops below sixty degrees, a thermostat will be used to cut them out entirely under such conditions. The moths then will be discouraged by the low temperature, as they will not lay their eggs below that temperature even though it is dark. It is planned to try colored lights in conjunction with the other arrangements.



Examples of Documents as They Appear on Keyed Receiver, Left, and on Any Other Set at the Right; Inventor at Top

## SECRET PAPERS SENT BY RADIO THAT DECOMPOSES THEM

Documents that must be kept in utmost secrecy, including plans, maps or illustrations, can be sent by radio with absolute safety by means of a unique telephoto machine recently developed abroad. The sending machine decomposes the photo or document and the receiving machine, which is keyed to the sender, recomposes it into its original form. Any other machine, although it can receive the same image, finds it merely a jumble of dots and splashes, which defy every attempt at interpretation.

New Brunswick  
N.J.

Ch. W. M. Belin  
France

signed material



1821

Cont. Hon. Isaacman, 55 W. 86 St.  
New York

# The KING

dent of the Bahia corporation, operators of a huge black-diamond mine concession in the state of Bahia, Brazil.

What's the difference between black and white diamonds? Black diamonds are worth more in cold cash, but they need no protection. You can't pawn them. An unidentified person can't sell them be-



"BLACK diamonds packed in herring barrels sold for twenty-five cents a carat in those good old Civil War days," sighed the "King of Carbon" as he let his hand play with \$100,000 worth of pebbles. "You wouldn't believe it," he went on, "but for a long time, a Dutchman used one 2,000-carat diamond, worth \$250,000, as a counterweight on a door!"

The romance of black diamonds hangs on such stories. There may have been half a million, or a million dollars' worth of black diamonds in the room with Arthur Bandler, the king of carbon, presi-

dent of the Bahia corporation, operators of a huge black-diamond mine concession in the state of Bahia, Brazil. cause every dealer in black diamonds is well known. And you can't give them to your sweetheart, because she would believe you were presenting her with a nugget of charcoal.

"They're tough," said the king. If in doubt, try to cut a black diamond with any other substance. It can't be done. The blacks are slightly harder than white

Largest Black Diamond Ever Found, Weighing About 3,078 Carats; Photo Is Three-Quarters Actual Size; Carrying Supplies to Diamond Camps





# of the BLACK DIAMONDS

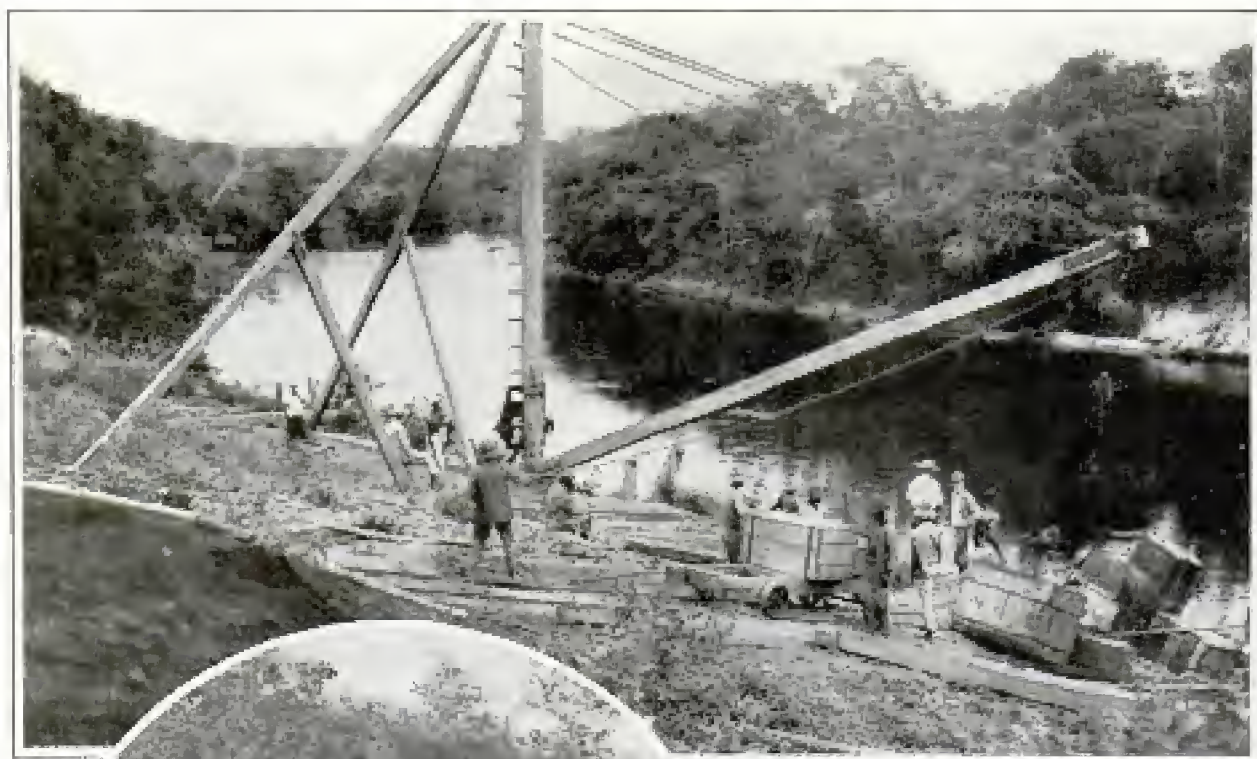
diamonds. White diamonds command money for their beauty, but there is no substance uglier than a black diamond. Other minerals may be beautiful, but none has more utility.

Tough is the word. A black diamond will scratch the hardest chromium steel or the next toughest mineral, corundum. And bite? Black diamonds have bitten through 6,000 feet of slate, limestone, granite and quartzite. Black diamonds have bored into millions of tons of iron ore on the Mesabi range. Black diamonds are exploring the foundations of Chicago for a rapid-transit subway. North of New York City, diamond drills are searching for water-tunnel sites. The king of carbon has sold the government enough black diamonds to drill 300,000 feet of rock at Hoover dam. In the Ural mountains of Russia, prospectors are diamond-drilling for copper lodes. Nevada prospectors are drill-



Natives Carry the Diamond-Bearing Dirt on Their Heads; Diamond Washers at Work





Unloading Freight Hauled 250 Miles through the Jungle; at the Left, the Rail Section of the Journey

ing for gold. Wherever industry needs the very hardest cutting tool, the king of carbon sells his wares.

He made a trip to Bahia in 1924, his pockets bulging with money. The industrial diamond market in the United States was at a standstill. Diamonds could not be purchased through the regular channels. A group of European traders had pooled their resources in order to cut off the American supply. Bandler disguised his mission under an assumed name. He had to see what could be done about it. And he dropped into Bahia like a meteor.

The king of carbon sought out independent traders and placed his bids high.

At that time the highest price paid for black diamonds was \$60 to \$70 a carat. The combined traders raised their bids. Bandler jumped his, and before very long, buyers were paying \$150 per carat. The king broke the backbone of the combine, and since then, the trade has been free to all.

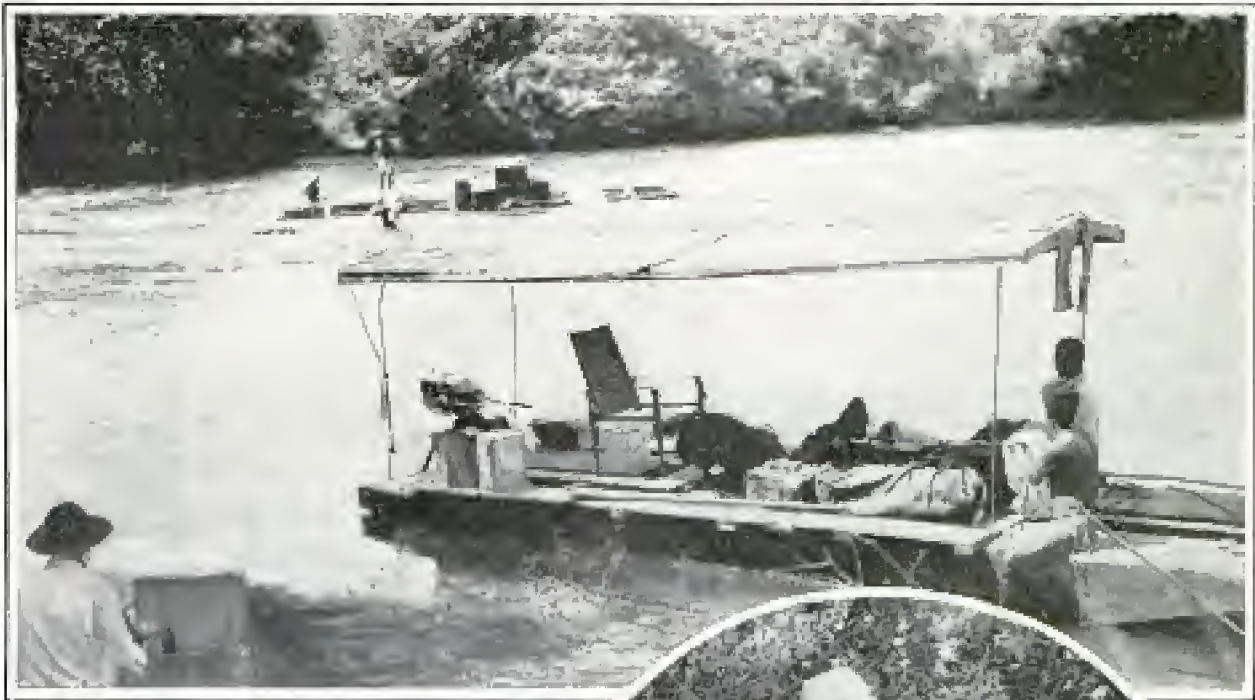
The terrors held out to prospectors in the black-diamond country were many. "Be careful," said a French hotel keeper to Bandler as he prepared to penetrate the jungle, "I once had visions of becoming the king of carbon, and now I am only the king of soup."

The dread of yellow fever, snakes and savage Indians did not deter Bandler, however. He was astonished to find that the natives were working their mines in the most primitive way, and that none of them had made an investment of even \$5,000.

He secured the first and only mining privilege ever granted in the Bahia district, a thirty-year government concession. He bought Mocombo, a 40,000-acre farm, for \$60,000 and later another tract of 70,000 acres, which gave him the right to both sides of the river.



9 18 21



First Outboard Engine in the Jungles, and, Right, an Expert Diamond Worker with His Pan

One of his first efforts was to rid the district of yellow fever. In this he was assisted by experts from the Rockefeller foundation, who drained the swamps and distributed mosquito-eating fish. The scourge which had attacked ninety-eight per cent of the population, was reduced to two per cent.

The king of carbon's mining operations have involved an outlay of \$700,000 for equipment. One thousand tons of freight had to be hauled to the concession. At Bahia, the machinery was loaded on sailing barges and taken fifty miles up the river; then 160 miles by rail, and the last lap of forty miles by river. Bandler's mines now employ 1,400 natives.

Never, according to Bandler, has any diamond trader been molested or robbed of his possessions. When a native hands over some carbons to a prospective buyer, he never asks for a receipt. The buyer may keep the stones three or four days in order to inspect them. A buyer rides his mule into the jungle with \$100,000 in cash on his person, and returns to the city with \$100,000 worth of carbon. There is no record of an ambush. The natives respect property rights.



The size of industrial carbons ranges from one-sixteenth carat up to several hundred carats. Large stones are rare. A 3,078-carat carbon was broken up for the diamond drills used to develop the Mesabi range. The king of carbon has, in the past five years, purchased and broken stones ranging from 100 to 458 carats. The Brazilian diamond deposits were opened long before the African mines. The black variety is found in no other country than Brazil, which also produces some white diamonds. The Braganza, 1,680 carats, said to be the largest ever discovered, came from Brazil between 1741 and 1797; the Star of the South, weighing 254 carats, in 1853.



cmr Walter E. Burton  
 988 1032 Poplar MECHANICS  
 Akron, Ohio

Police Motorcycle  
 Equipped with Radio-  
 Receiving Set; Note  
 Mast for the Aerial  
 and Loud Speaker in  
 Front of Driver;  
 Batteries and Other  
 Parts Are in Sidecar



# MOTORCYCLE WITH RADIO SET SPURS WAR ON CRIME

As an auxiliary to the police automobile fitted with a short-wave receiving set, a radio-equipped motorcycle is now being built for police use. The motorcycle is faster and more economical to operate than a car, and with radio connections to a central sending station, its usefulness in thwarting crime is further increased. The receiving set is carried in a sidecar, along with batteries. A short mast, mounted on the car, carries the aerial, and an air-column speaker is fastened to the frame of the machine, the horn opening being in front of the driver. Even at high speeds the radio has been found to function satisfactorily.

# FRANCE FIRST IN WAR PLANES; U. S. LEADS CIVIL FLYING

France now leads the world in air armament with 4,683 fighting planes, according to a recent estimate. The British empire is second, with 2,065, Italy third with 1,834, and the United States fourth with 1,809. France also is first in number of pilots trained for war, with 7,952, the United States second with 4,668, the British empire third with 3,858 and Italy

fourth with 3,715. These figures are for both active and reserve forces. But in civil aviation, the United States leads the world powers. It has 49,254 miles of airways, as compared with the British empire's 22,297, Germany's 20,272, France's 19,750 and Russia's 19,002. There are 1,258 airports in the United States, as compared with 507 in the British empire, 256 in Russia and 176 in France. The United States, with 10,235 civil planes in operation, also is first in that classification, the British empire coming second with 2,070, France third with 1,320 and Italy with 750. And this nation has 16,709 civilian flyers, more than all the other powers combined.

# LION-PROOF HUTS FOR VISITORS TO SOUTH AFRICAN PARK

Lion-proof huts are provided in South Africa's Kruger National Park for the protection of tourists. These huts have cement floors, mud or cement walls and thatch roofs, with an open space between roof and walls for ventilation. The newer huts have windows, but some visitors object to these because of lions. In "Hints for Our Visitors," a pamphlet distributed by the park officials, the tourist is advised not to become alarmed if lions stop and stare at his automobile. Just slow down, advises the pamphlet, and the lion will move out of the way. But the visitor is warned against getting within 100 yards of a lioness with cubs, and advised to stop his car until the mother has taken her cubs safely away.

# PLANES CARRY STARVING BIRDS IN MIGRATION OVER ALPS

Airplanes were used recently in Austria to supplant nature in sending birds on their annual flight to warmer climes for the winter. Thousands of swallows

Akron, Ohio Police Dept

91970

Comparative Air Armaments  
 of the World, compiled by  
 Carl Boyer & Associates

9/24/11  
 Science of France



arriving from the north descended in the streets of Vienna and on farms and buildings, so exhausted that it was almost certain they would either freeze or starve on the long journey over the Alps. A society for the protection of animals and birds chartered several airplanes, and bird-lovers collected the migrants and brought them to Vienna, where they were loaded into wooden cases, carried over the mountains in the planes and liberated in Italy.

*1867*

# COAL SOLD IN FANCY BASKETS TO JAVANESE CONSUMERS

Coal, wrapped in fancy baskets, is hawked to consumers in Java, where one never telephones his order to the coal dealer. Most of the residents prefer to buy one day's supply at a time from the coal salesman, who carries about one shovelful in each of his baskets.



Two of Java's Coal Salesmen Are Shown with Their Fancy Baskets, Containing One Shovelful



Watering the Garden Is Easy with This "Rain Gun" Connected to a Well or Stream

# "RAIN GUN" WATERS FLOWERS FROM POND OR STREAM

Watering the flowers during a drouth is made easy by a "rain gun" which produces a spray with the aid of an electric generator and a connection to a near-by pond or stream. It takes but a few seconds to pump the water from the pond through the nozzle and produce enough rain for a large garden.

# ELECTRICITY FROM AIR MOTOR

Generation of electricity in commercial quantities by trapping enough wind and air currents to turn a rotor generator will be attempted in a New Jersey test plant. A four-mile wind will turn the rotors fast enough to produce electricity, the engineers say, while in dead calms, rotors mounted on giant trucks will be pushed around a circular track at sufficient speed to set the rotors spinning.

*Patent rights sold to Public Service Corp. of New Jersey, in cooperation with 4 utility companies*

*Dr. J. J. Schuchert  
 Berlin Germany  
 No 4 Sagent Street*

*1907*

*See Jan. 1902  
 0.00.*



a 1947 Logan H. Olanoff, 55 W. 42nd St.  
990

POPULAR MECHANICS  
New York

# Explorers of Universe Find the Earth a Speck



Some of the Vastness of Space May Be Grasped from the Illustrations Above; the Earth's Speed of Eighteen Miles a Second Is Slow Compared with Light



# and Its Terrific Velocity Just a Snail's Pace



The Nearest Star May Be Seeing What Took Place on the Earth More than Four Years Ago; Our Whole Solar System Is But a Minute Part of the Universe about It



4/19/29 992

Q 1950

Isreal Western

Crown Iron works Co. 1229 Tyler St.,  
Muncie, Ind. Minn



Exercising Wheel on a Fox Farm, in Which the Animals Get Miles of Running without Leaving Their Cages

**EXERCISING WHEEL FOR FOXES  
KEEPS THEM HEALTHY**

Owners of fox farms where these active animals are raised for their pelts, always face the necessity of providing exercise to keep the captives healthy. Plenty of running in a restricted area is furnished by an exercising wheel for them. This wheel is about five feet high and is surrounded by a wire cage. It stands vertically and about its rim is a track in which the animals are placed. Their movements cause the wheel to revolve, thus enabling a fox to get miles of running without leaving the cage.

**BLIND SHORT-WAVE OPERATORS  
195 TALK AROUND WORLD**

More than a dozen blind operators are licensed to conduct experimental communications in the short-wave range in the United States. Radio is used by these amateurs in conversations with "hams" not only in this country, but the world over. Usually they have only improvised sets. William D. Terrell, of the department of commerce, obtained the census of sightless operators through co-operation of district radio supervisors.

Director of Radio

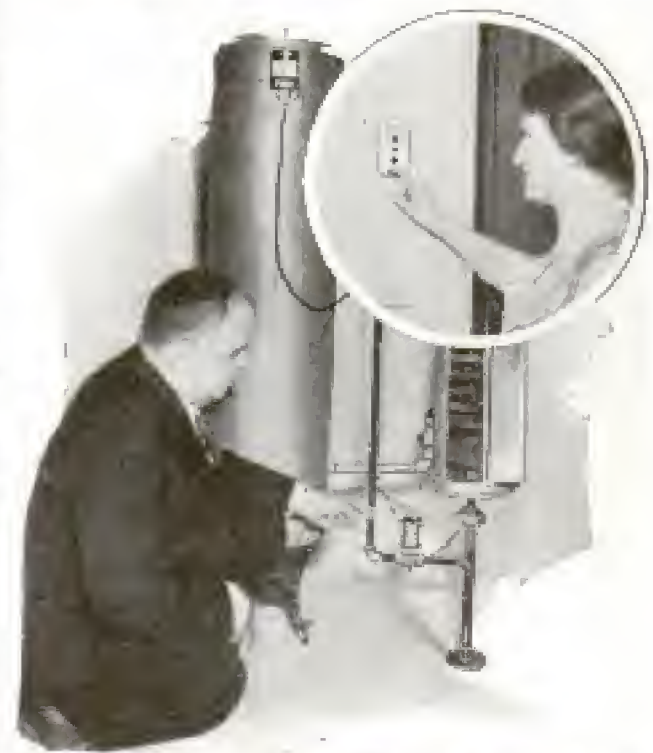
**WHITEWASH AIDS EASY  
RIDING ON RAILWAY**

Whitewash dropped on sections of a famous British railway aids maintenance crews in spotting bends and rough spots which otherwise might escape their notice. A whitewash car makes regular inspection tours over the line, and an electrical apparatus causes a quart of the fluid to splash on the track at every point where the car sways too far. Repair crews follow the car and fix the track at these points.

Q 1906

**PUSH BUTTON CONTROLS  
WATER HEATER**

By means of electric push buttons in the kitchen or bathroom, the gas heater connected to the water tank in the basement of a home can now be controlled automatically. The attachment is electrically operated and easily installed. At the press of a button, the gas is turned on and, when the water reaches a predetermined temperature, it is shut off automatically, or this can be done at any time by pushing another button.



Gas Heater in the Basement That Is Controlled by a Push Button in Kitchen or Bathroom

Isas. Isard Co. Inc.  
375 Main St.  
Rochester, N.Y.

US Daily 9/22/31

Q

9/27/31





Everybody Got Wet during the Filming of This Submarine Movie in England Recently: Note the Cameras Standing in the Water and the Bathing Suits Worn by the Operators

## CAMERAS OPERATED IN WATER FOR SUBMARINE FILM

During the filming of a submarine picture in England recently, not only the actors but the cameras and operators as well were forced to take to the water to obtain some of the shots representing the interior of a flooded submarine. The cameras were set on tripods placed in the water and the photographers were bathing suits while shooting the scene.

## AMERICAN CHEMISTS PREPARE TO GET OIL FROM COAL

Although American crude oil is now so low in price as to cause acute distress in several oil fields, the supply is not inexhaustible and chemists are looking to the day when we shall have to make gasoline and lubricating oil out of coal, as they are already doing in Germany and other European countries. At the meeting of the American Chemical society here a

series of experiments on soft coals from both eastern and western United States fields were described by Prof. H. K. Benson and his associates at the University of Washington. The process consists in subjecting coal to pressures from 2,200 to 4,200 pounds per square inch, at temperatures from 200 to 450 degrees centigrade in the presence of water vapor. The oily mixtures obtained by this procedure compared favorably with the product of European coal treated in the same way. We commonly think of even soft coal as pretty hard stuff. Yet coal is a jelly—a colloid, to use the strictly scientific term. Evidence to this effect was adduced by Dr. Reinhardt Thiessen, of the bureau of mines. Using a new ultra-power lens, he has seen the "micellæ," or ultimate visible particles that go to make up coal, and has found them similar in size and shape to the micellæ of plants, which, of course, were the raw material of coal ages ago. The colloid nature of coal has long been suspected, but not verified until now.

Prof. H. K. Benson, University of Washington, Seattle, Wash.

at Estree, Harfordshire.

Wed Work

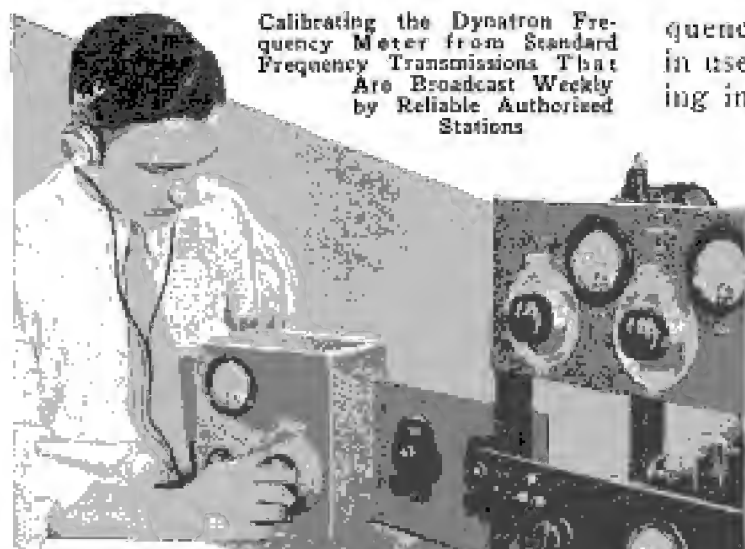
01827

Science Service Wire  
9/3/36



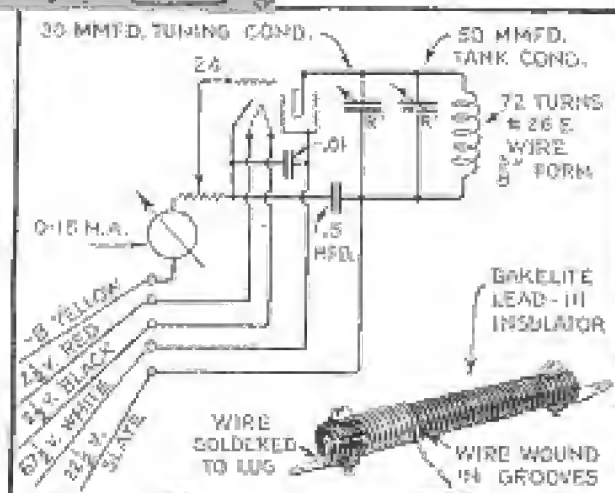
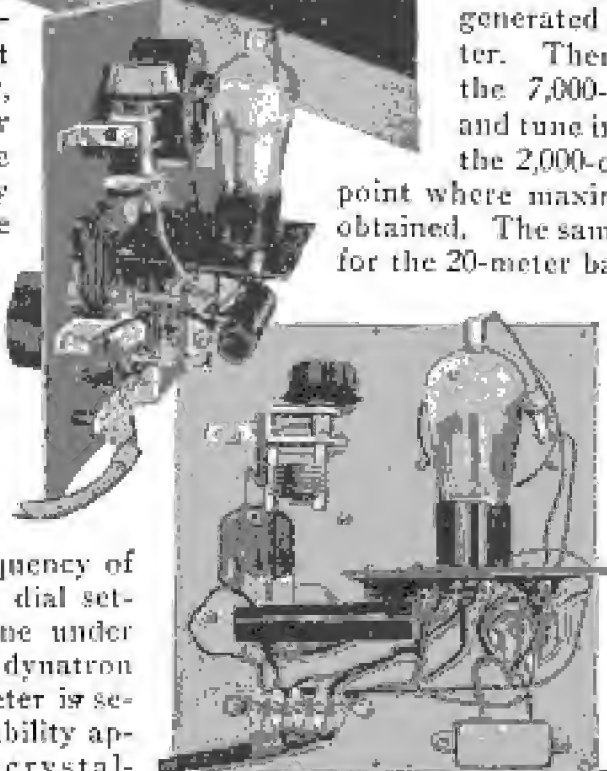
# Meter Helps Amateurs Check S-W Bands

Calibrating the Dynatron Frequency Meter from Standard Frequency Transmissions That Are Broadcast Weekly by Reliable Authorized Stations



UNLIKE the monitor, which is just a miniature receiver, the frequency meter is an oscillator whose signal is picked up by the receiver in the same manner as the monitor signal is picked up when adjusting the transmitter to a certain point in the band. The oscillator used in a frequency meter must be quite stable in order that the frequency of oscillation at a given dial setting may be the same under all conditions. This dynatron type of frequency meter is selected because its stability approaches that of a crystal-controlled oscillator when correctly built. The single coil is permanently installed to cover the 80-meter band, as the dynatron is very rich in harmonics and the 20 and 40-meter bands operate on the harmonics of the tuned circuit. The oscillator circuit of the dynatron frequency meter will not change in calibration except by loss of voltage in the batteries and aging of the tube. To check and correct this shift is a simple matter, as the milliammeter is connected to show the current taken by the tube, and this value is easily maintained when the fre-

quency meter is calibrated and while it is in use. Calibration is obtained by listening in on the weekly standard frequency transmissions. A  $2\frac{1}{2}$ -volt filament transformer is used or with slight changes a 222 or 232 dry-cell tube may be substituted. A power supply separate from the receiver's is advised. The coil may be wound on a grooved bakelite insulator, as shown, but any good form of the same diameter can be used. To prepare the frequency meter for transmission calibration, first set the short-wave receiver on the 3,500-kc. band and tune in the signal generated by the frequency meter. Then tune the receiver to the 7,000-kc. or 40-meter band and tune in the harmonic. Adjust the 2,000-ohm potentiometer to a point where maximum signal strength is obtained. The same procedure is followed for the 20-meter band. The idea is to find a point on the potentiometer where it operates best on all bands. The standard frequency signals may then be tuned in and the meter signal beat against the receiver until zero beat occurs. Then it is at the exact frequency of the standard signal transmitter.





### Transmitting-Tube Operation

When placing a transmitter in operation after periods of idleness, some tubes may be found inoperative. This does not necessarily mean that the tubes are defective, the condition often being caused by gas given off by the metals in the tubes during the idleness. If the tubes have not been in use for some time, a half-hour period of filament heating is advised. In addition, reduced plate voltage should be applied when the station is placed in operation and gradually increased to normal.

### Loud Speaker from Headphones

An experimental loud speaker for small sets may be made at a cost of about 50 cents or less. The sound chamber is made of sheet metal in the form of a cylinder, the dimensions of which are indicated. A hole is cut in the center to take the end of a large tin funnel, with the end cut off

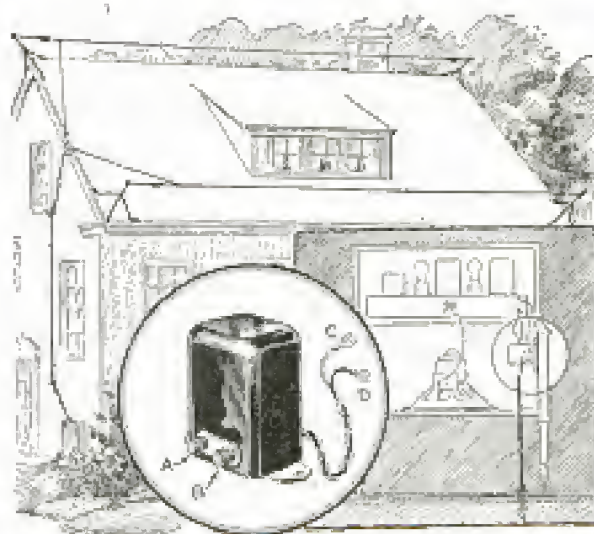


so as to leave about  $\frac{1}{2}$  in. of the spout, which is slit back to form four tabs. These are peened over on the underside of the metal sheet and soldered. The cylinder is then formed over a wooden dowel, of the proper

diameter, and the edges are brought together and either soldered or riveted to make a sound-tight compartment. Felt washers are placed over the ends of the cylinder and the headphones may then be clamped in position.—W. A. Paltridge, Hollywood, Calif.

### Several Receivers on Single Antenna

When there are two or more receivers in the same dwelling this antenna-coupling unit, recently introduced, saves much trouble and expense by enabling multiple reception from one antenna. Connected into any single radio receiver, the coupler is claimed to eliminate interference and permits long lead-ins without loss of sig-

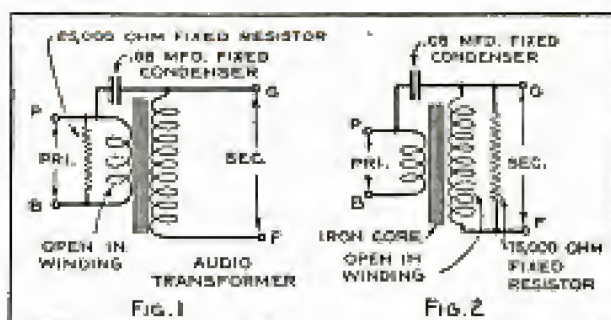


Antenna Installation with Long Lead-In through Basement; Insert, Coupler and Method of Mounting

nal strength, sensitivity or selectivity. A unit is installed in the speaker compartment of each set, as shown in the sketch at lower right. Where two or more sets are used, an additional, or master, coupler is used in the lead-in wire or wires, one being required for every ten receivers.

### Audio Transformers Quickly Repaired

When the receiver goes dead and a continuity check, made with a lamp or meter in series with a battery, shows an open primary or secondary winding, the first thought is a new transformer. Suitable replacement transformers are not always available, but a satisfactory repair may be made quickly with the fixed resistors and condensers inserted in the circuit as shown. In Fig. 1 the open primary is shunted with a 25,000-ohm resistor. The same idea applies to the open secondary in Fig. 2, but the resistor value should be 75,000 ohms.



Temporary Repairs for Open Windings in Audio Transformers

Brass plates from old condensers can be cut up to make other radio parts.

Chicago 35 & Wacker

General Motor Radio Corp. Dayton, Ohio

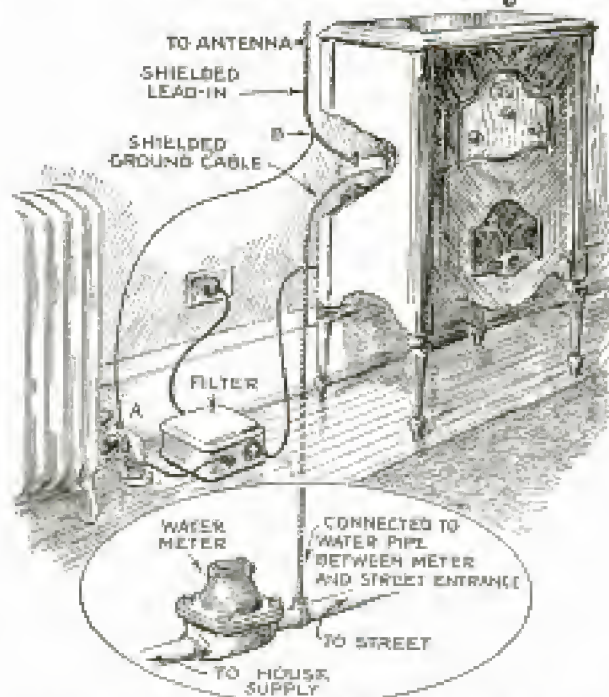


## Neat Service Pays

When preparing to service small apparatus, it is a good plan to spread a large sheet of clean white paper on the workbench. The instrument to be repaired is placed in the center of the paper so that the small parts may be arranged in an orderly manner on it as they are removed. If there are many such parts, a cardboard box to hold them will also be found handy. More time than the actual work takes, otherwise may have to be spent looking for parts.

## Trimmer Condensers Can Be Made from Battery Switches

Old battery switches of the push-pull type, Fig. 1, may be easily altered to make serviceable trimmers or midget condensers. The insulating button at the tip of the plug is removed, and the end of the shaft is drilled and threaded to take a 6-32 machine screw and nut, as shown in Fig. 2. The condenser plates may be cut from old parts or from thin brass or aluminum sheet. The movable plate is clamped tightly under the end nut. It may be necessary to rearrange the insulating washers under the side posts, and the spring under the post that holds the stationary plate should be removed. This post should be completely insulated from the base and a soldering lug is used as shown. To avoid hand capacity, the rotor shaft should be grounded in the usual manner. The spring bearing against this



Completely Shielded Installation, Showing Connections to the Filter

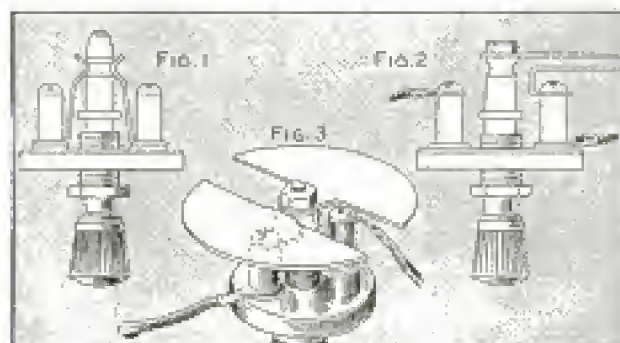
### Filter Stops Power-Line Interference

A well designed filter at the power input to the receiver will remove interference carried on the power line. It also prevents coupling to ground. In many cases where bad local interference is encountered, it is also a good idea to use a shielded lead-in wire. The metal sheath is grounded to a radiator at A and B, as is also the filter, but in no case should the filter and receiver be grounded at the same point. For the receiver ground to the water pipe a shielded lead also is used.

### Adjusting Screen-Grid Receivers

Some screen-grid sets have noticeably poorer tone when the volume control is near the minimum position, but, unless the volume is cut down, powerful locals are too loud for comfort. In such cases, lifting the cap from the top of the first tube lessens the coupling between the antenna circuit and the next r.f. stage. The volume control may then be turned up to normal position with much better tone quality. This may be done without tools and does not injure the set. For distant stations the cap is replaced.

For further information on any radio construction article write to the radio department; this service is free.

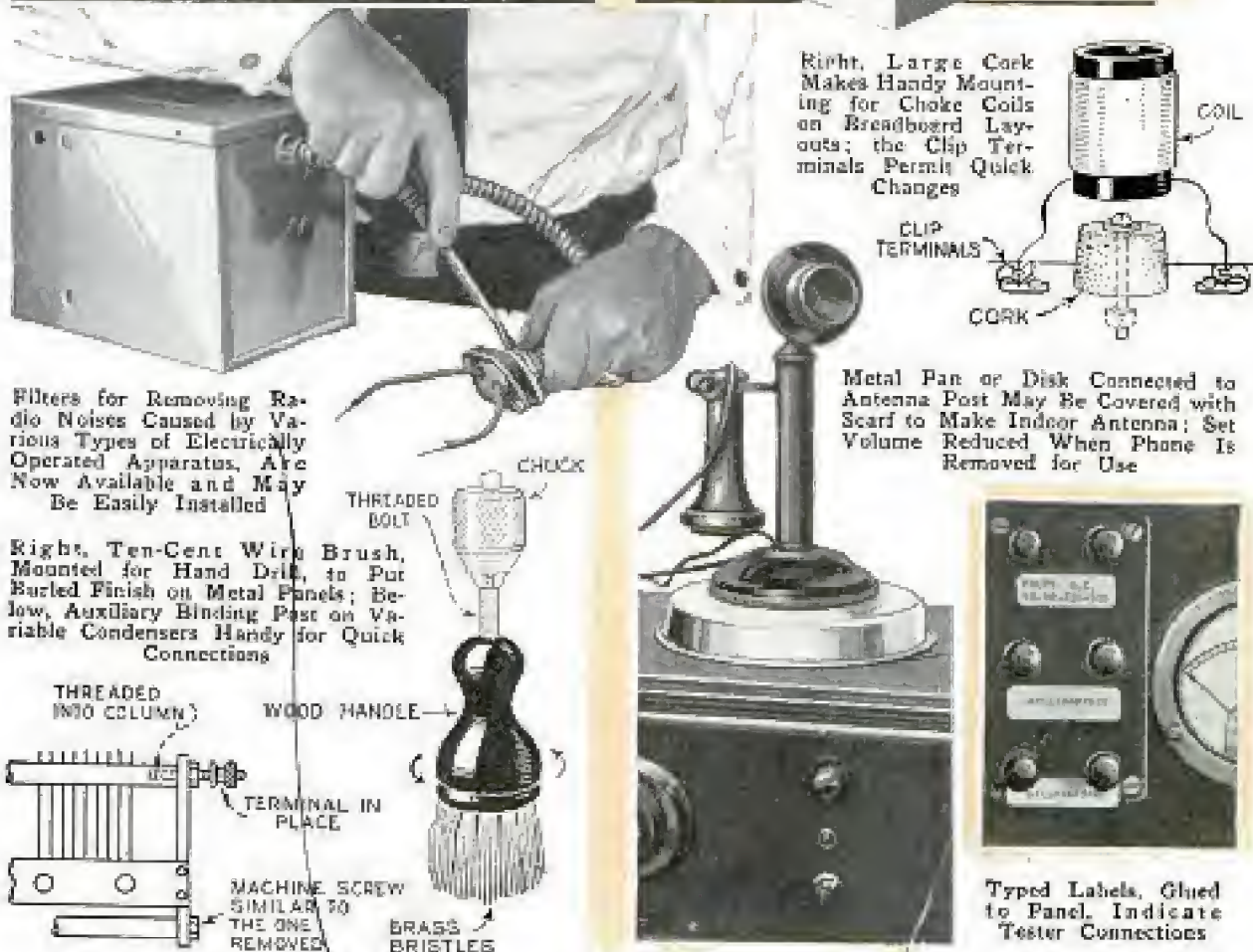
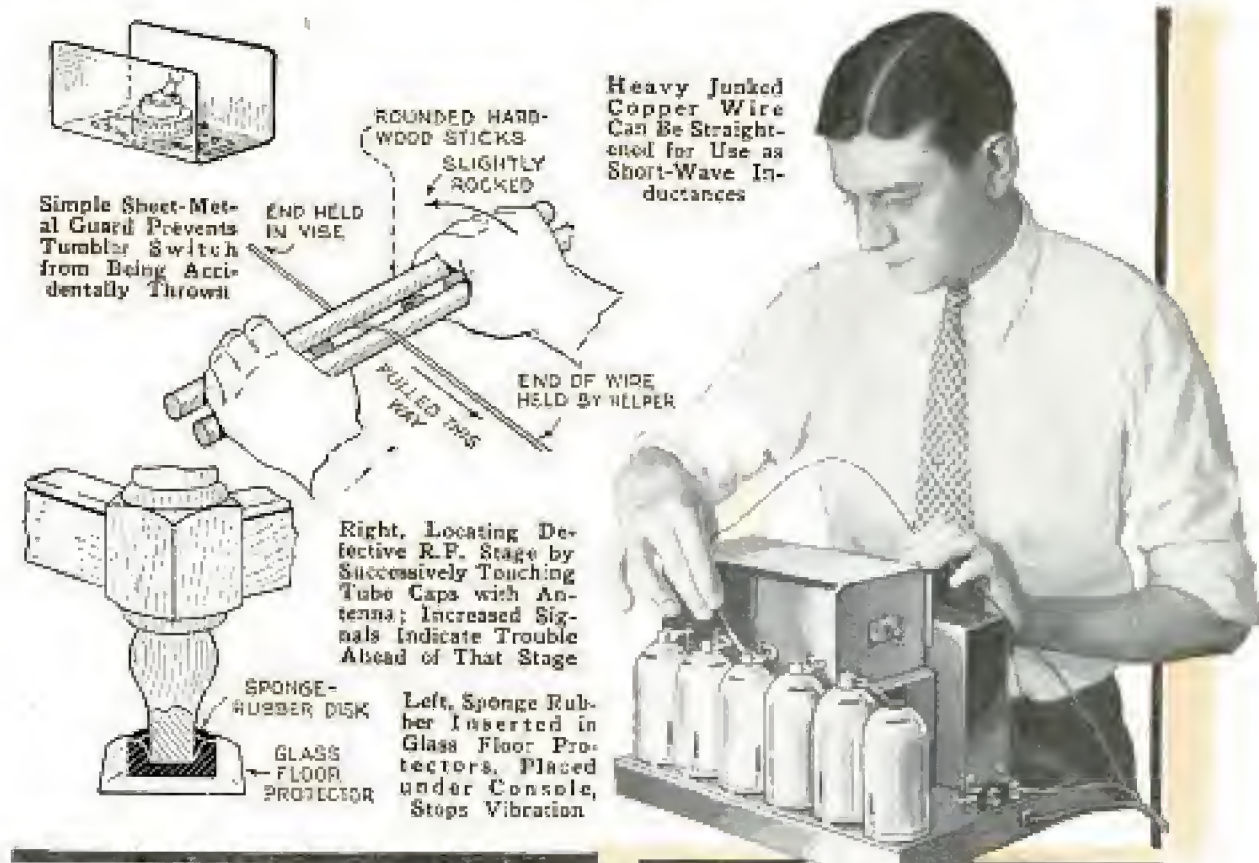


Details for Altering Battery Switch to Serve as a Trimmer Condenser

shaft provides the rotor connection to the post at the left. The top view, Fig. 3, shows the shape of the plates and the method of mounting the stationary plate. —Parker Snapp, Eugene, Oreg.



# Easy Ways of Solving Your Radio Problems



*Jobe Leutschmann & Co.*  
*Canton, Mass.*

Copyrighted material

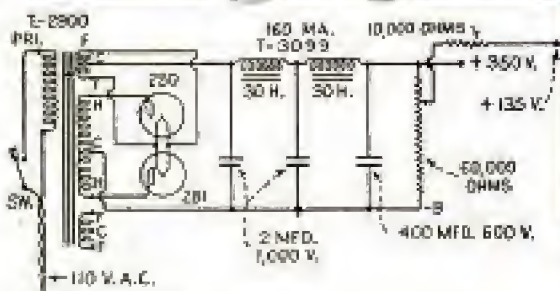




# Power Supply *for* Crystal-Controlled Oscillator

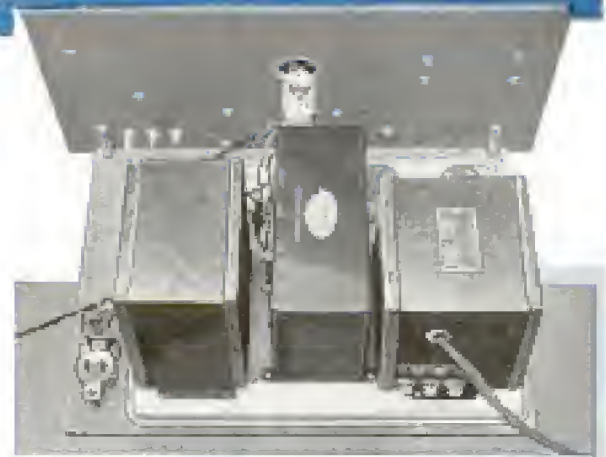
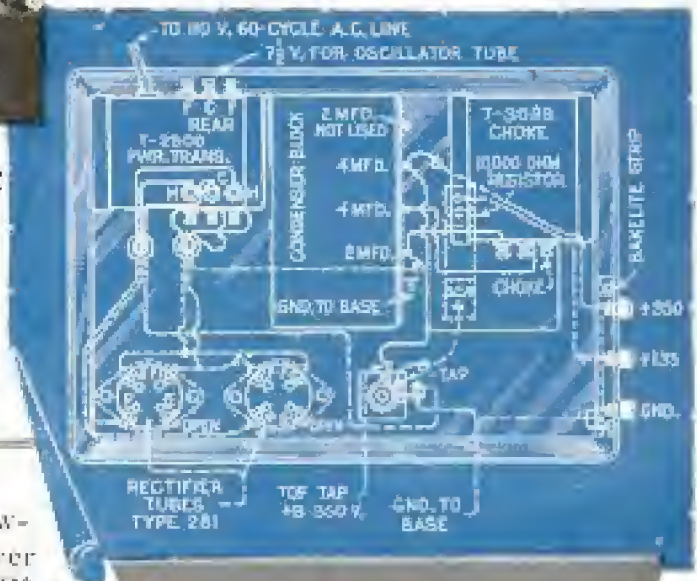
tube. The voltage divider should be a 100-watt tapped type. The additional 10,000-ohm unit, in series with the 135-volt lead, may be omitted if desired. A B-eliminator voltmeter should be used to check the output voltages carefully while under load, to be sure they are the specified values.

The assembly is quite simple: The unit is screwed to the baseboard as shown: the front panel is  $\frac{1}{4}$  by 9 by  $17\frac{3}{4}$  in. and carries the filament and plate-supply switches, microphone input jacks, pilot



**A** SEPARATE and well filtered power supply is installed on the lower shelf of the 50-watt phone and CW-transmitter, for the crystal-controlled oscillator described in the September, 1931, issue. This power unit is assembled on an aluminum baking pan, the bottom of which measures  $8\frac{1}{2}$  by 12 in. Three binding posts are mounted on a bakelite strip screwed inside the base at one end.

The power transformer supplies 350 volts for the plate of the oscillator tube and 135 volts for the plate of the type-227 tube in the speech amplifier located in the top panel. It also furnishes the necessary filament voltage for the rectifier tubes, and an additional 7.5-volt filament winding is available for the oscillator



light and also the optional keying relays.

(To Be Continued)

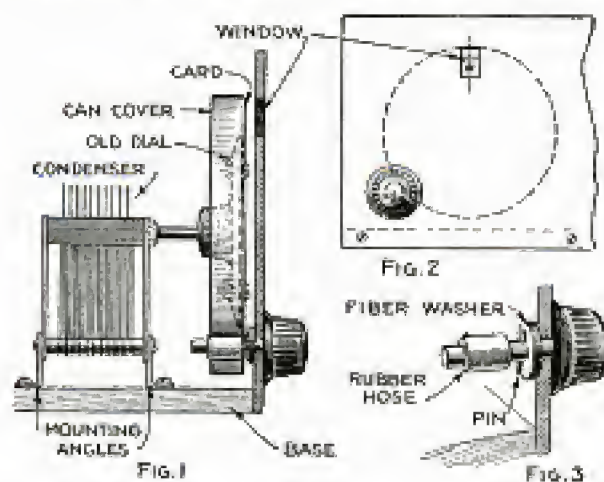


### A.C. Tubes on D.C. Supply

It has been found that the a.c. radio tubes are very satisfactory for use in automobile receivers owing to their rugged construction. The 227 and 224-tubes are provided with filaments that draw 1.75 amp. at 2.5 volts. This is the average for a.c. supply, but, when d.c. is used, a resistor of suitable value, in series with the heater, should be provided, so that the current drawn will be slightly less than 1.75 amp. As these tubes have 2.5-volt heaters, two of them may be connected in series so they will total 5 volts from the 6-volt car battery. In this case only a small resistance drop will be required to give the proper operating condition.

### Vernier Dial from Can Cover

A cover from a tin coffee can, an old flat-type dial and a few odds and ends from the junk box will make a serviceable vernier dial, as shown in Fig. 1. The tuning control is mounted in a single  $\frac{1}{4}$ -in. hole drilled in the panel. A hole for the condenser shaft is drilled through the knob of the dial so that the latter may be held to the shaft by the usual setscrew. The can cover is then fastened to the dial with two short machine screws as indicated. A circular card is fastened to the can cover at front where it may be seen through a hole cut in the panel. The usual dial markings are filled in or the various station call letters printed on the card. The window may be fitted with a celluloid cover and illuminated from the



back if preferred. The front panel arrangement is shown in Fig. 2 and the driveshaft for the control knob in Fig. 3.



Antenna Installation with Shielded Lead-In for Eliminating Interference

### Shielded Lead-In Reduces Interference

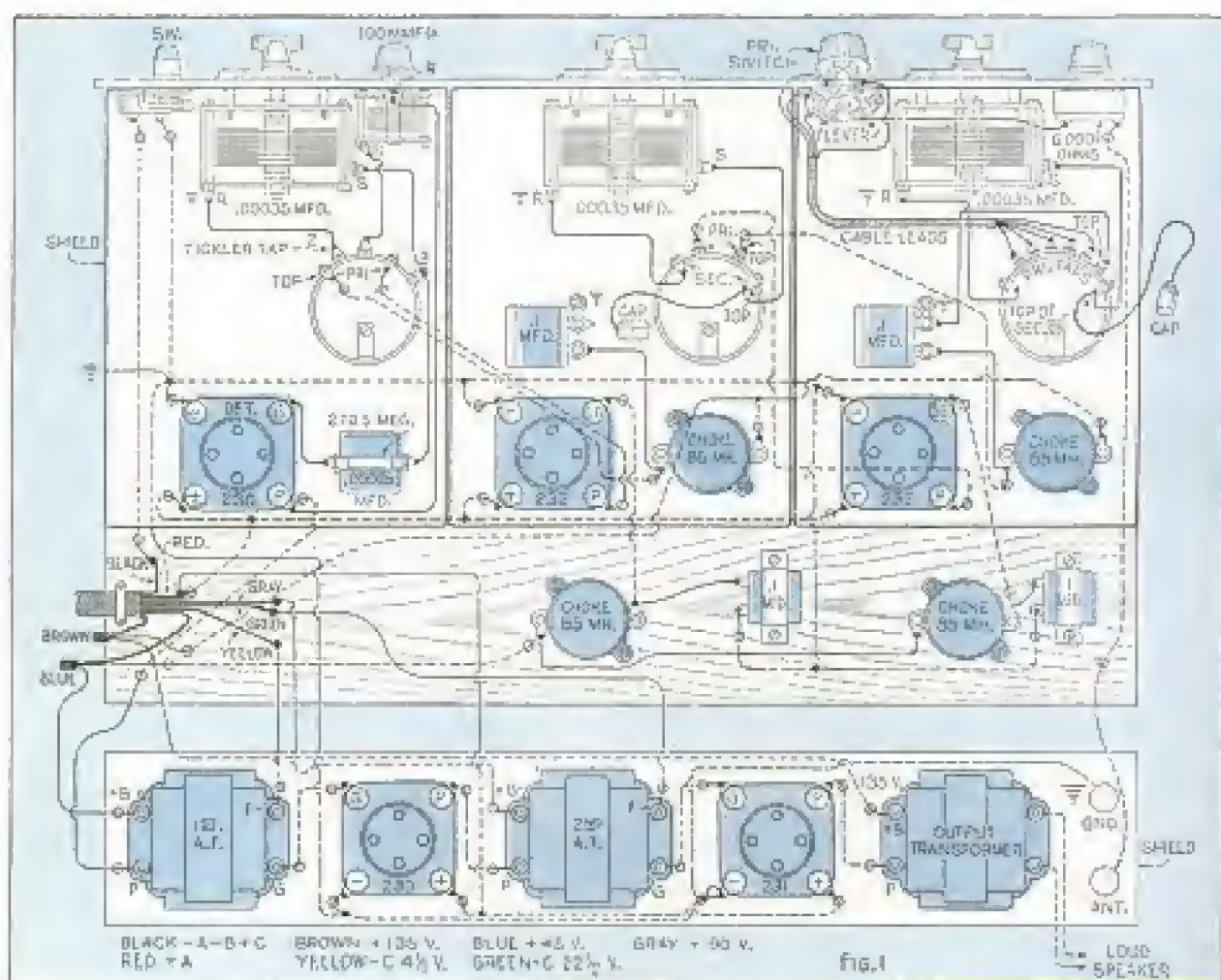
There are many ways in which the radio owner can help himself in overcoming interference or "man-made static." This is caused by interruption in the flow of electric current and also by the discharge of voltage accumulation on conductors. Whenever such conditions exist, a discharge occurs, and the resulting high-frequency voltage causes a current to flow along the conductors in which the effect takes place. This interference may be carried directly to receivers or radiated from the conductor and enter the receiver through the antenna or ground connection. A simple method of overcoming much of this interference is to provide a special lead-in wire consisting of a stranded No. 14 conductor, rubber insulated and having a metal braid outside the insulation. When this is used, a high antenna, about three times the length of the lead-in, should be erected and the lead-in carried in one piece from the antenna to the receiver, as shown. The metal sheath should be stripped 2 in. from each end and the sheath connected to a ground. Whenever possible, this ground should be independent of that used for the power and telephone wiring. All grounds should be made to clean metal.



bility of using many old parts, make the Little Giant receiver especially attractive to the experimenter. B-batteries or a B-eliminator may be used as desired. The circuit is flexible and subject to a number of variations that make it ideal for the farm home and camp or wherever power lines are not available.

To duplicate the fine results that have been obtained with this hookup, the coils should be wound on bakelite tubing, 4½ in. long and 2 in. in diameter. However, there is no reason why these results could not be obtained with regular commercial coils, provided they are of the screen-grid type and match the condensers employed. The tapped-type antenna coil is optional, but will be found quite useful in congested districts where a greater degree of selectivity is required.

The volume-control unit is connected in the antenna circuit and will enable the





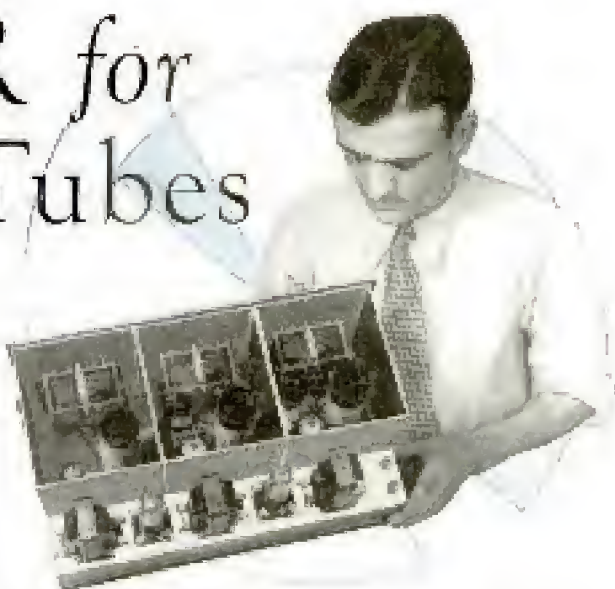
# RECEIVER *for* Two-Volt Tubes

By HENRY S. LARABY

operator to reduce the volume on strong locals to prevent the blanketing effect of such stations from interfering with DX-reception. Shielding is optional, but when properly done improves this as well as any receiver. If the builder does not care to make up the shields as shown, aluminum box shields of similar size may be purchased. If so, it may be necessary to rearrange the layout within the shields. If the receiver is to be used at some distance from powerful broadcasting stations, all shielding may be omitted. If no shielding is employed, it will be necessary to have a 24-in. baseboard instead of 17 $\frac{1}{4}$ -in., so that the coils may be mounted farther apart and at right angles to each other, to lessen the risk of coupling. In both cases, the coils are mounted above the baseboard by means of 1-in. angle brackets.

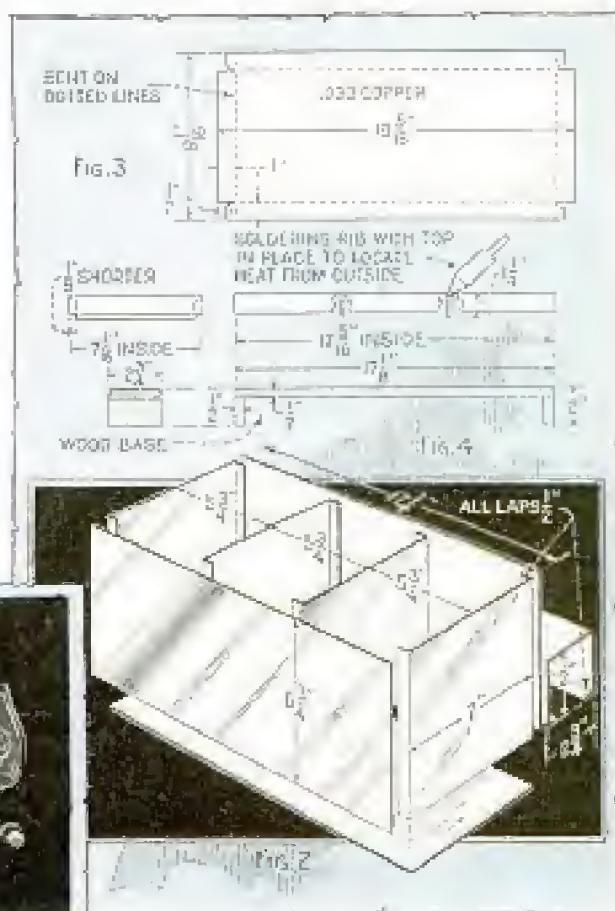
The simplified wiring diagram, Fig. 1, shows the completely shielded layout with the audio stages, mounted on the rear shield, removed to reveal the wiring and parts assembly below. This rear shield and platform, Fig. 4, was used to make a more compact assembly rather than for any shielding effect obtained. If the platform is not used, it will be necessary to add 2 $\frac{3}{4}$  in. to the depth of the baseboard. The bakelite front panel is  $\frac{1}{8}$  by 8 by 18 in.

The baseboard is made from  $\frac{1}{2}$ -in. stock, and narrow strips of the same material are used at the rear and sides to elevate the base slightly in order that as



much of the wiring as possible may be run below.

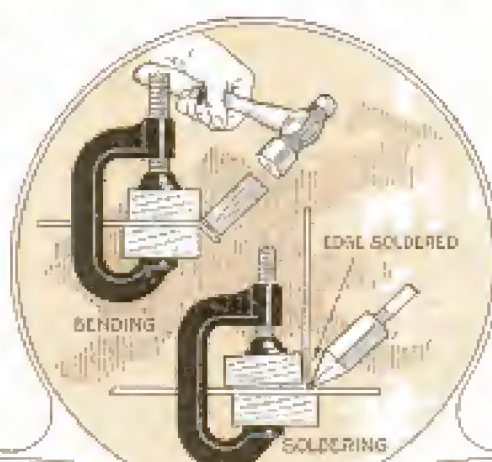
It will be noted that all shielding and the rotors of the .00035-mfd. variable condensers are common with A-negative and ground. The rotors of these condensers, and other points indicated, must be grounded whether shielding is used or not. The 100-mmf. midget-type condenser for controlling regeneration must be in-



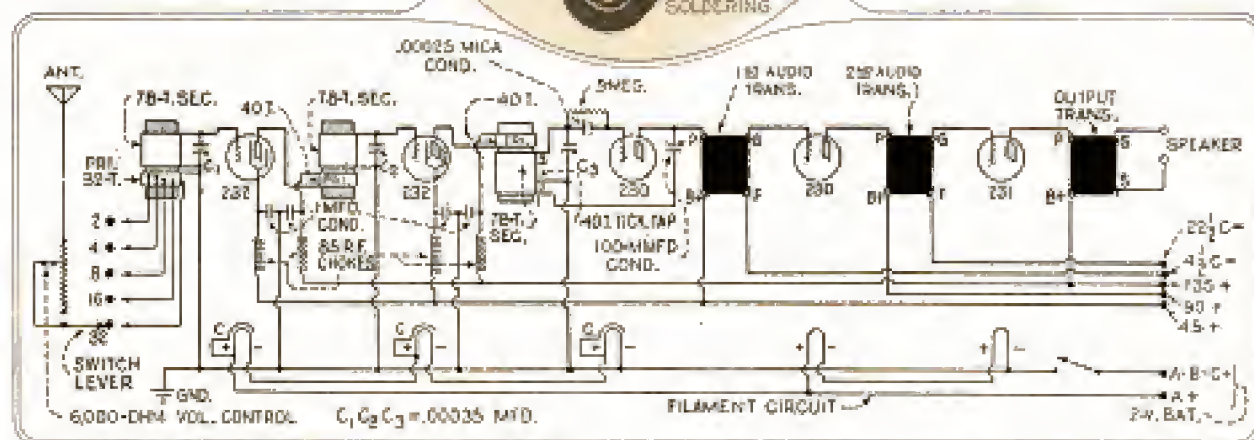


insulated from the metal shielding by means of suitable washers or by making a cut-out in the shield at the rear of the front panel. The primary inductance switch and the A-battery switch must also be insulated from the shielding in the same manner.

The shielding details



nections. This cable is clamped to the base-board at left rear, as shown in Fig. 1, the circuit connections being made to these leads where they are soldered and carefully taped. Enlarged blueprints and list of parts, which are all standard, are available.



given in Figs. 2 and 3 are quite simple, but the construction may be varied to suit the builder, provided the over-all dimensions are held to the specifications given. For example, the top and bottom covers may be made identical. The laps on the covers may be  $\frac{1}{2}$  in. instead of 1 in., as shown in Fig. 3, with square cut-outs at the corners for simple butted and soldered joints instead of the more complicated corners, although the method shown is stronger. If a flat-bottom piece is used, as shown in Fig. 2, the endpieces are lapped over at the bottom edge and are screwed to the baseplate and board. This type of construction is handy, as much of the assembly and wiring may be done directly on the baseplate of the shield before the sides are assembled. This method of assembly should also be followed for the front shield and panel, as it will be difficult to assemble and wire the instruments on the front panel after the shielding partitions are soldered in place. A simple way of bending the shields and soldering the joints is shown on this page, the C-clamps being inexpensive and very handy for the experimenter.

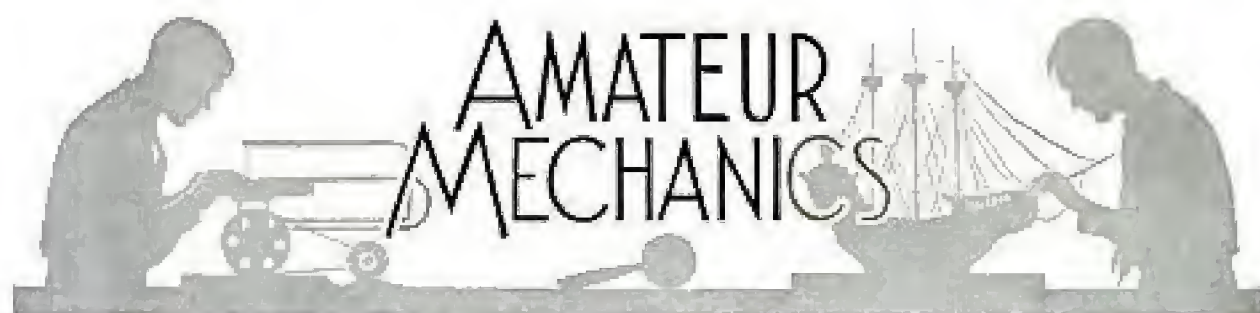
Five feet of seven-strand color-coded cable is used for the various battery con-

nections. The tubes are all of the 2-volt type and draw very little current. When the dry cells are used as an A-battery, it is necessary to connect a 25 or 30-ohm rheostat in series with the negative lead to the set, to reduce the output to 2 volts. The negative-B and positive-C connections are made to negative-A directly at the batteries. The antenna is connected to the insulated binding post mounted on the metal shield covering the shelf at the rear. The ground post is mounted directly on the shield. Any good magnetic speaker will give excellent results.

To tune the receiver, turn on the filament switch and place the volume control in the full-on position. Rotate all three dials in step until a station is tuned in. Adjust the primary-inductance switch and regeneration-control condenser to the point where the station comes in with the desired volume and clarity. It will be found that, by leaving the volume control full on for DX-reception, the set may be controlled to advantage by means of the regeneration control alone.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists free.





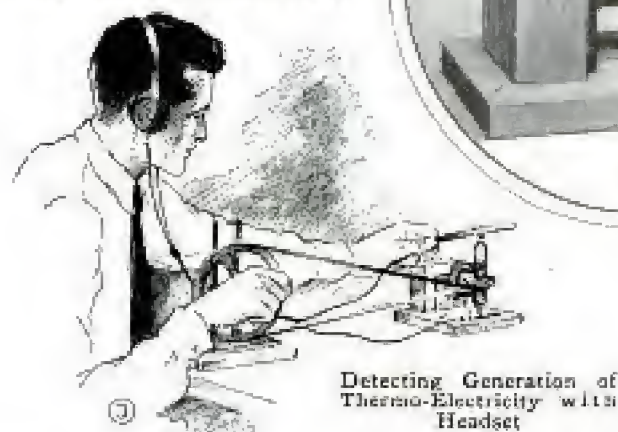
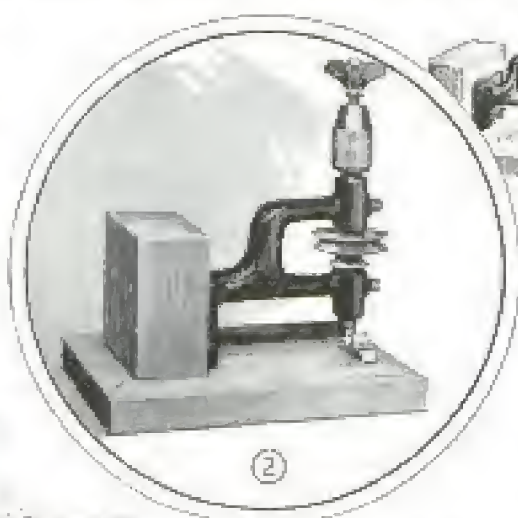
# Centrifugal Toys *that Amuse*

By Raymond B. Wailes

**BY USING** the driving head or headstock from a home-workshop lathe, which can be had at almost any 25-cent to \$1 store, interesting experiments can be conducted to demonstrate the basic principles of physics involved in many industrial machines and other devices.

Among the simplest of experiments by using such a headstock, and also a handwheel or small motor for driving it, is the one shown in Fig. 1, illustrating how friction generates heat. Take a small brass tube

enough heat will be produced to cause the liquid to boil, and generate sufficient



Detecting Generation of Thermo-Electricity with Headset

with one end soldered shut and hold it in a chuck on the headstock, which should be mounted on a wooden frame as indicated in Fig. 2, so that the tube will be held vertically. Fill the tube with water or alcohol, and cork the top. Clamp both the headstock base and the handwheel to the table, connecting the two by a suitable belt. By holding a band of emery cloth, canvas, or even two strips of wood, tightly against the tube while rotating it,

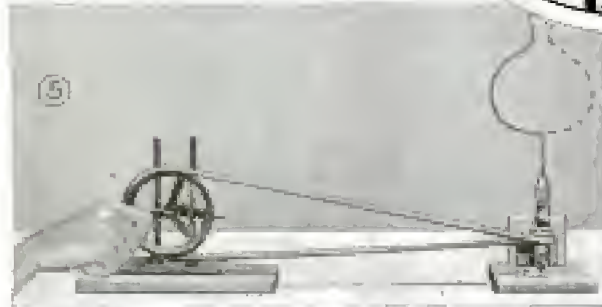
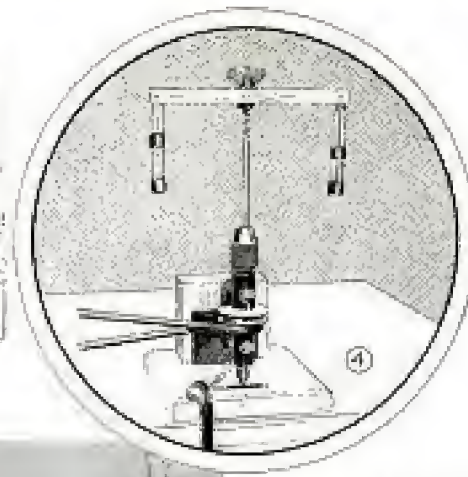
steam to cause the cork to blow out with a loud "plop."

Friction produces heat and heat produces electricity, which is then called "thermo-electricity." To demonstrate this transformation of energy, hold a machine screw tightly in the chuck, a wingnut and a locknut being

driven up against the head so that the nut will not rotate. A spring clip is then screwed to the base directly under the center of the headstock, so that the two are in contact. Now connect one cord of a radio headset to the clip and the other to a copper strip, which is held against the wingnut while it is rotated rapidly, as shown in Fig. 3. The copper strip is struck every half revolution of the shaft by the wingnut, causing it to become hot and generate a pulsating direct current evidenced by a clicking sound in the headset.

Figure 4 shows a simple centrifuge, the principle of which is employed in cream separators. Get a strip of wood, about 10 in. long, and drill a hole through it at





the center so that it can be attached to a long bolt or screw held in the chuck. At the ends of the strip, two small cages holding test tubes are pivoted, spacing them equally from the center. The cages should be of equal weight, to obtain a perfect balance, and they must be free to swing outward. Muddy water in the tubes will become clear after turning the device several minutes. Centrifugal force acts on particles of greater weight more readily than on lighter ones, and therefore the dirt particles are thrown to the bottom.

The principle of the steam governor may be illustrated by using the device shown in Figs. 6 and 7. This device is somewhat like the centrifuge, but in addition to the two swinging members, which are pivoted to the ends of a short horizontal bar, a sleeve is slipped over the rod that holds the bar, and two links connect the sleeve to the hinged arms, all joints being pivoted. In operation the sleeve creeps up as the arms rise toward a horizontal position. In the real governor, the sleeve is connected to a lever that controls some part of a machine, and in a steam engine, it regu-

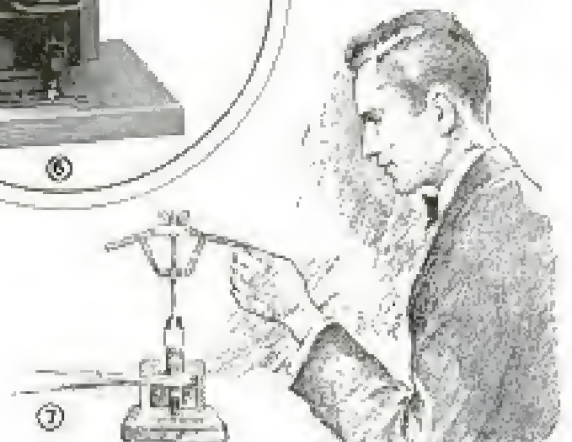
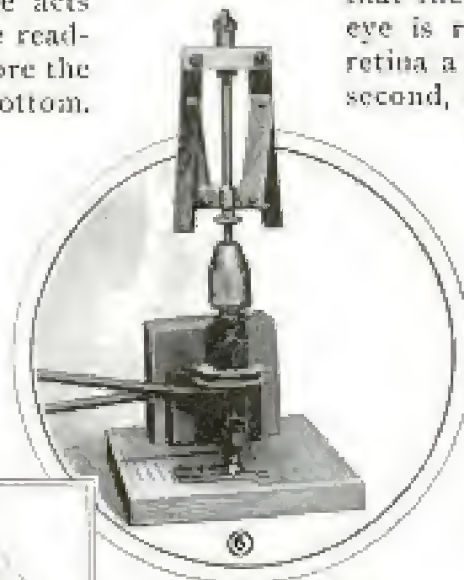
lates the supply of steam delivered to the steam chest by opening or closing a valve. As the speed of the engine increases, the arms swing outward, raising the sleeve and partly closing the steam-inlet valve. When the engine speed slackens, the opposite action takes place. Other experiments with centrifugal force will readily suggest

themselves. Colored disks of various sizes and shapes can be made to blend into each other when fitted to the rotating shaft. Spheres made from flexible flat strips will flatten at their poles when rotated, explaining the depression of the earth's poles by its rotation. Cardboard disks toothed along the periphery can be made to produce musical notes when a stiff card is held against the teeth.

Persistency of vision can be quickly demonstrated by bending a piece of stiff wire to form one-half of a vase, as in Fig. 5, allowing one end of the wire to project at the bottom for attachment in the chuck. Turning the wire gives the illusion of an entire vase, due to the fact

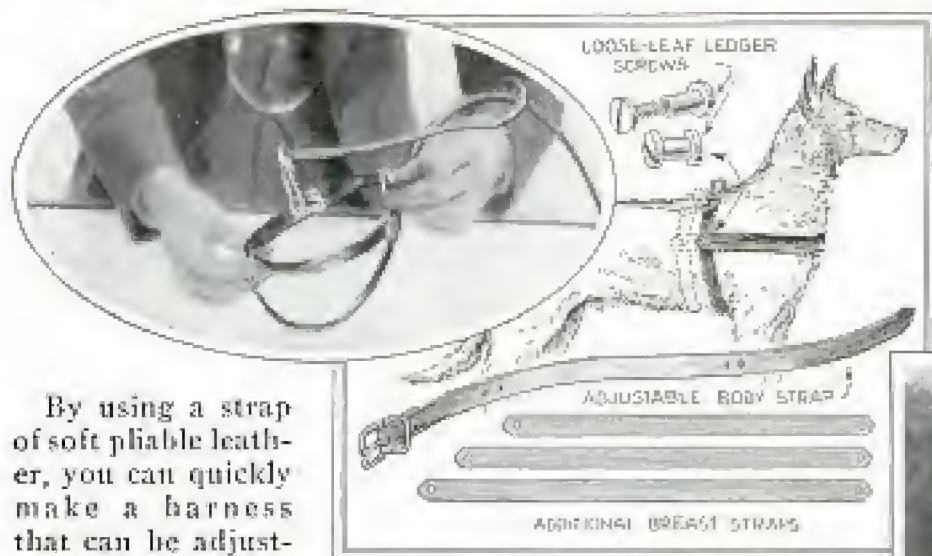
that the image seen by the eye is retained upon the retina a slight fraction of a second, a principle which

has its most common and popular application in the presentation of moving pictures.





# Adjustable Harness Fits the Growing Puppy

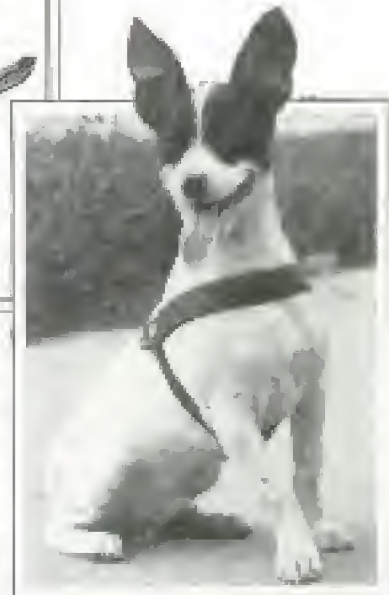


Made from Soft Leather Straps. This Puppy Harness Has a Wide Range of Adjustment

By using a strap of soft pliable leather, you can quickly make a harness that can be adjusted to fit a growing puppy over a period of several months. Starting at the buckle end of the strap, measure off the distance around the pup's body, just behind the forelegs, and punch several holes at  $\frac{1}{4}$ -in. intervals for adjustment of the buckle. This piece is used for the body strap, and the nameplate or license tag may be riveted to it if desired. The breastpiece is then made from the remaining portion of the strap and fastened to the body strap by means of loose-leaf ledger posts, inserted through holes in the two straps as indicated, punching an extra hole in one side of the body strap to allow for vertical adjustment of the breastpiece. It is necessary that the ends of the latter be fastened at

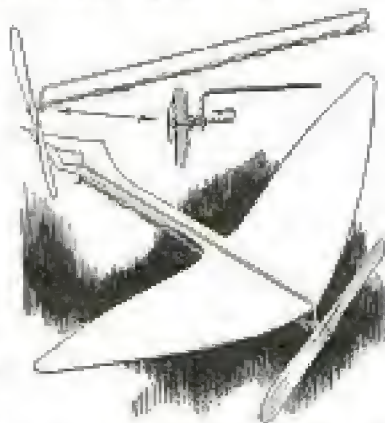
points high enough on each side of the body strap so it will fit over and be supported by the animal's shoulders. To

provide an adjustment for the breast strap, let the ends extend beyond and to the rear of the body strap, and punch two or three holes at  $\frac{1}{4}$ -in. intervals in each end, or a separate strap can be made for each adjustment. When the harness is properly assembled, the buckle will be at the top and will serve as a leash ring.



## Power for Small Paper Glider

The boy who likes to make paper gliders can transform them into small planes by adding a rubber-band motor and a propeller. A paper clip is straightened out and an eye bent at one end and a hook at the other. A pin serves as an axle for the propeller. It is inserted through the eye in

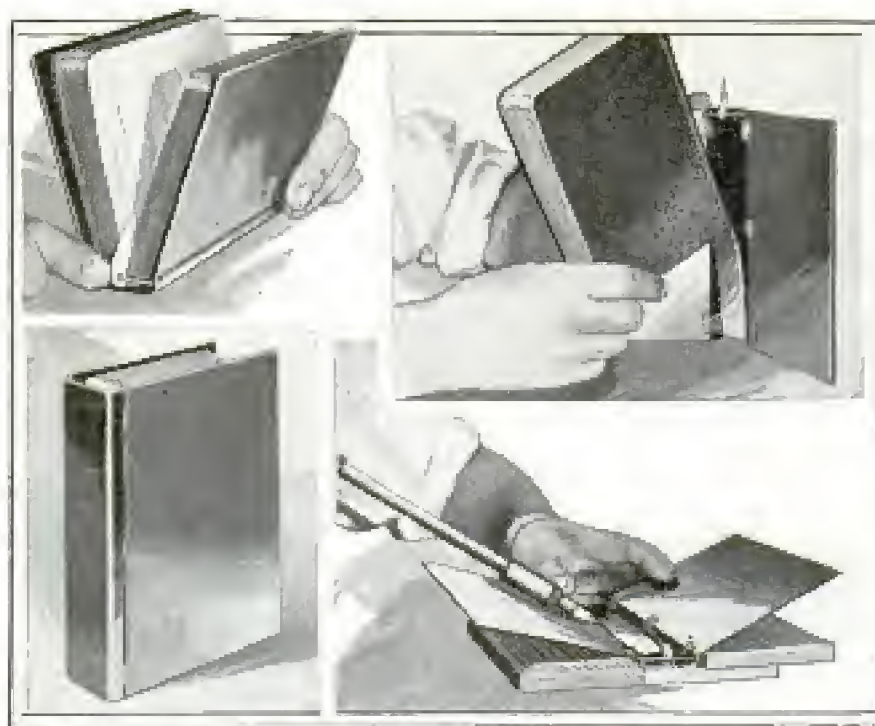


the clip and the end bent to form a hook. The clip is then slipped over the glider as indicated, and a rubber band fastened to the bent end of the pin and over the hook on the end of the clip. A small bead between the propeller and the eye of the clip greatly reduces friction.—J. V. Hazard, Washington, D. C.

## Pushing Curtain Rod through Hem

Gummed-paper tape placed over the ends of curtain rods helps slipping them through the hems of the curtain, and prevents tearing the fabric. A thimble slipped over the end of the round metal rod will serve the same purpose.





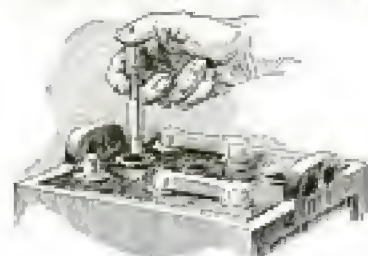
Your Favorite Books Will Be Protected with These Metal Covers Which Have a Mirrorlike Finish and Can Be Etched or Engraved

### Metal Covers for Your Books

You can easily provide your favorite books with beautiful covers made from nickel-zinc. The sides of the cover are cut  $\frac{1}{4}$  in. larger than the book and attached to the back with small hinges. A strip of stiff spring steel is soldered at one end inside of the back to hold the book as shown, while a length of shim brass, fastened to a nail soldered across one end of the back, provides a book mark as shown in the upper left-hand detail. If desired, designs or the title of the book can be etched or engraved on the covers.

### Height of Electrolyte in Batteries Tested by Glass Tube

Guesswork can be eliminated, and perhaps a battery saved, if you use a glass tube for testing the height of the electrolyte in storage batteries. Insert the tube into the battery until it



touches the plates. Then place your finger over the top of the tube to make it air-tight, and withdraw it, holding it above

the filler opening. The exact height of the electrolyte above the plates will be shown by the amount in the glass.

—A. H. Waychoff, Phoenix, Ariz.

### How to Make Pipe Coverings

Water pipes in an unheated cellar or garage can be kept from freezing by the application of homemade insulation consisting of tar-paper wrapping around the pipe, a layer of felt over the paper, and a cover of canvas. The entire assembly is fastened together with paste or wire ties, after

which it can be given a coat of waterproof paint. Another method is to wrap the pipe with layers of old cloth, then newspapers and lastly with burlap. This cover should be 4 to 5 in. thick.

### Ash Catcher Fits Cigaret Holder

Bent to conform to the shape of a cigarette and fastened to a holder, a piece of thin sheet aluminum will provide a catcher to prevent ashes from falling on rugs and furniture. Two small projections are left on one end of the aluminum, with which it is clamped to the holder as shown.—Anthony E. Zipprich, New York City.



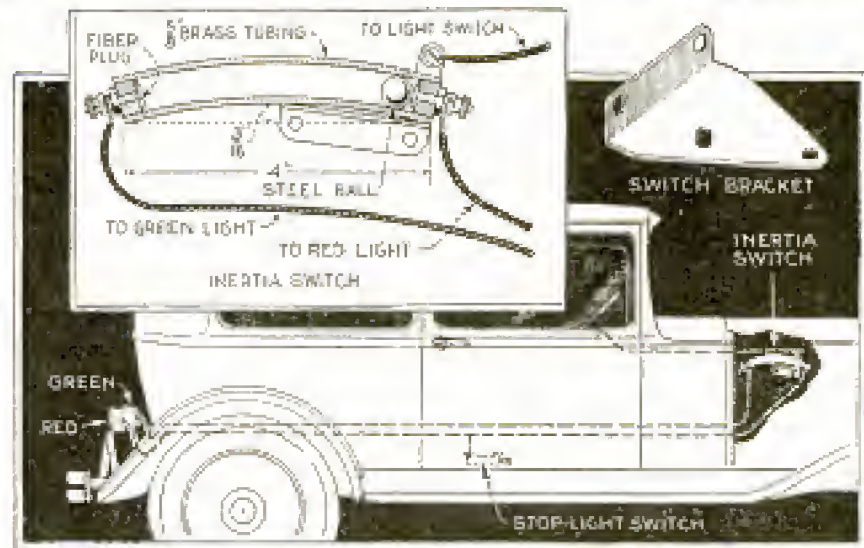
### Waste Locates Cause of Puncture

When it seems almost impossible to find the object that caused a tire puncture, try this method: Take a handful of waste and brush it back and forth inside of the casing. If there is anything sticking through on the inside, some of the threads in the waste will be caught on it. —Grant H. Ogden, Denver, Colo.



# Stop and Go Lights for Auto Are Automatic

Wide variation in the visibility of tail lights makes it difficult for a driver to judge the exact distance to a car ahead of him, which increases the hazard of night driving. A one-color stop light does not indicate whether a car is standing still or moving, and for this reason a two-color stop-light combination, which works automatically by means of an inertia switch, offers additional safety, the green light indicating movement and the red one that the car is at a standstill. The inertia switch consists of a length of brass tubing slightly bowed. Fiber plugs are fitted to the ends, and a steel ball is held inside, which makes contact with the wall of the tube and with machine screws projecting through the fiber plugs. A bracket is provided for holding the switch under the hood, in the position indicated, and wires are run from the screws on the switch to the lights, the front screw being connected with the stop light and the rear one to the green light, on a single-wire system. The bracket must be mounted on a piece



Curved Brass Tube, with Steel Ball and Contacts at the Ends, Forms Automatic Switch to Operate Stop-and-Go Lights on Auto

of fiber or bakelite so that it will not be grounded, and it is connected to the light switch, to obtain current. The stop-light switch, operated by the foot brake, is connected as indicated, instead of running a separate and parallel lead to the light. In operation, the momentum of a moving car throws the ball against the rear contact, causing the green light to function. When brakes are applied, the ball is thrown forward against the front contact, lighting the stop light. When the light switch is turned off, the lights will not function; only the stop light, when the brake pedal is depressed.

## Repair for Broken Window Glass

Brass shim stock, or other thin sheet metal, of a thickness that will slip through the crack in a broken pane, will hold the glass in place. The strip must be about  $1\frac{1}{2}$  in. wide and as long as needed.

Notch both sides, forming triangular tabs as shown in the detail, the narrow strip in the center being equal to the thickness of



the glass. Insert the strip and bend the prongs up and down alternately. This makes a sturdy and neat repair.

## "Teeter-Totter" Candles for Parties

A large tallow candle, pivoted at the center on a needle, will slowly dip in "teeter-totter" fashion when lighted at both ends. The needle may be hung on stiff wires, or supported on two blocks with grooved tops. Several smaller candles may be fastened to the larger candle, and when the entire assembly is lighted and in motion, the cluster provides a fascinating centerpiece for the table. It makes a hit at any party.—Bert Russell, Harrison, Idaho.





Pane of Glass Supported in Vertical Position Provides Means for Copying Drawings and Pictures

### Copying Pictures by Reflection

Supported vertically by two wooden blocks, a pane of glass can be used for making copies of pictures and drawings. The work is placed to the left of the glass, and a sheet of plain white paper is laid to the right. By looking through the glass from the left side, as shown, an exact reflection of the work will be seen on the plain paper where it can be traced with a pencil or pen. Of course, the position of the worker's head in respect to the glass should not be changed while the copying is being done, or the drawing will be distorted.

### Suction Cup Holds Window Cards



Here is a clip that will hold your display cards at any place on the window. It consists of a rubber suction cup, such as is used to hold ash trays to windshields, and a large paper

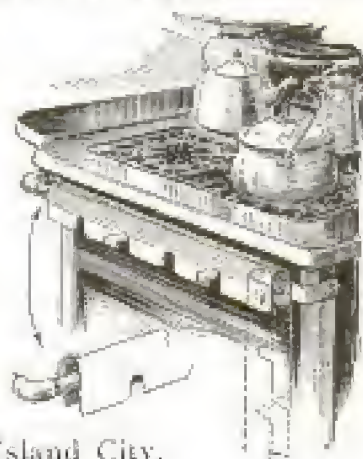
clip bolted to it as shown in the photo. The cup is stuck to the window and the card held by the clip.

### Tire Tube Mends Pipe

Water pipes cracked by freezing or for any other reason, can be quickly repaired by using an old inner tube. It is cut into a strip that is long enough to wrap around the pipe three or four times, and is stretched while being wrapped. It is bound with wire or tape. This emergency repair usually will stop the leak and last until warm weather when the pipe can be replaced.—Millard Loe, Blanchardville, Wisconsin.

### Safety Shield over Gas-Stove Cocks

A shield over the cocks of the gas stove is useful in preventing children from turning the gas on or off. It consists of a piece of sheet metal, bent to fit as indicated and hinged at one end to the stove. Notches are cut in one edge to fit over the cock handles, and should be just large enough to allow adjustment for a high or low flame, but not so large as to allow them to be turned off or on without raising the shield.—Robert J. Bailie, Long Island City, New York.



### Flashlight Bulb Tests Windings of Generator

Open circuits in the winding of a generator can be detected with a flashlight bulb. Connect the bulb to the generator and then turn the latter at a fairly high speed. If the bulb burns steadily, the wiring is all right, but if it burns with a flicker, the trouble is in the commutator or in the wiring.

☛ An efficient and ornamental chain for hanging pictures and maps can be made by joining a sufficient number of ordinary wire clips.

(copies) may be made by Corp. 14 26 W. Randolph St. Chicago  
 new Jersey  
 30 Church St. New York  
 Mechanical Publishing Corp.



#776

**T**

HIS beautiful Sheraton mirror may be used with decorative effect over a console table in a hallway or above a chest of drawers in a Colonial bedroom. Mahogany is the proper wood for the frame and should be finished in a reddish-brown antique, with the little gilded quarter-round band or bead next to the glass. A plate-glass mirror, 12 by 20 in. in size, is required, which is a standard size, obtainable from any dealer in glass and mirrors.

The frame parts should be made first, and here is where a molding cutter on your saw or a small shaper will be useful. Of course, a universal plane or a molding plane may be used or stock molding purchased, but molding similar to that shown in Fig. 8 is suggested. Fig. 1 gives the dimensions of the finished frame. The stock should be  $\frac{3}{4}$  in. thick with a  $\frac{1}{4}$  by  $\frac{1}{4}$ -in. rabbet cut into the inner edge to receive the glass. The miters at the corners may be cut with a miter saw or on the circular saw if it does accurate work. If you have a lathe equipped with a sanding disk and table, you will be able to make your miters absolutely true, in which case the sawing need not be so accurate. The miter gauge from your saw is then used to guide and feed the stock against the disk.

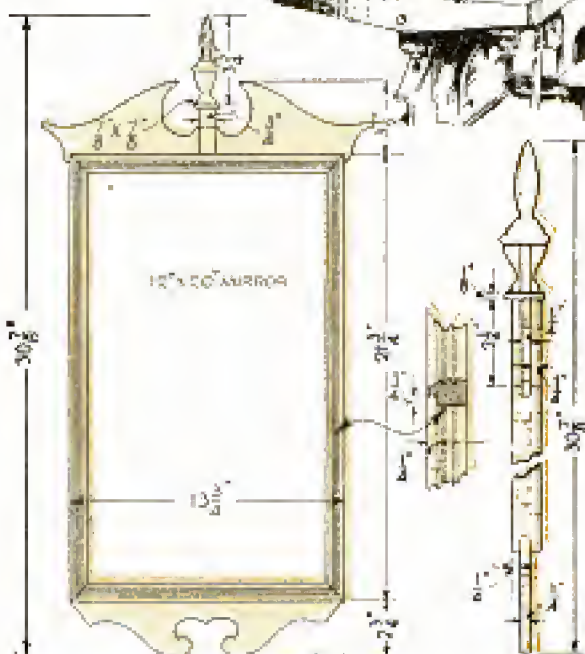
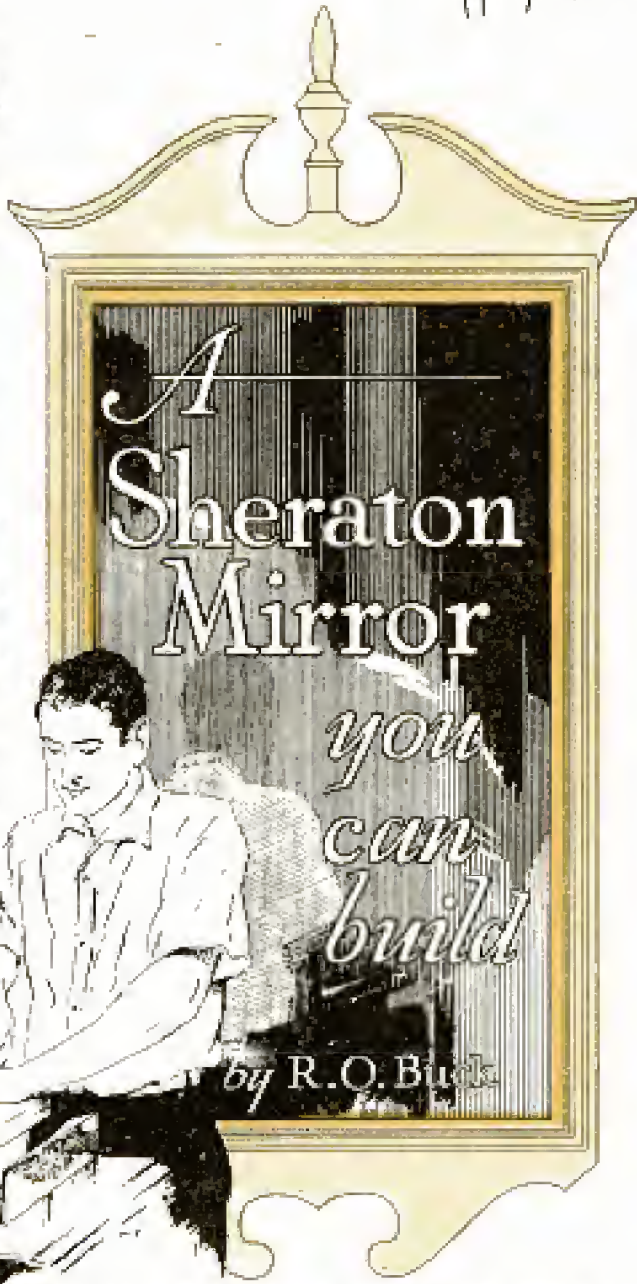
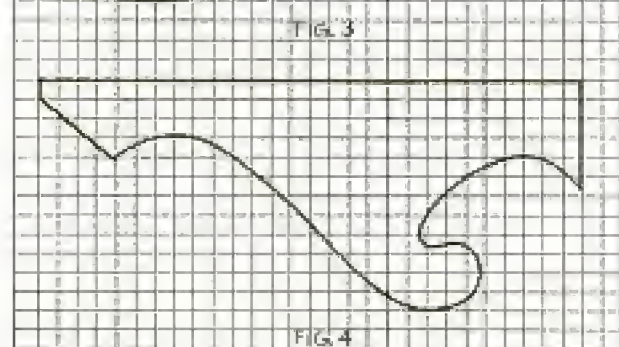
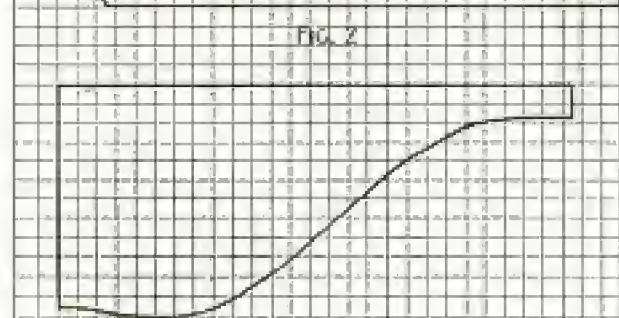
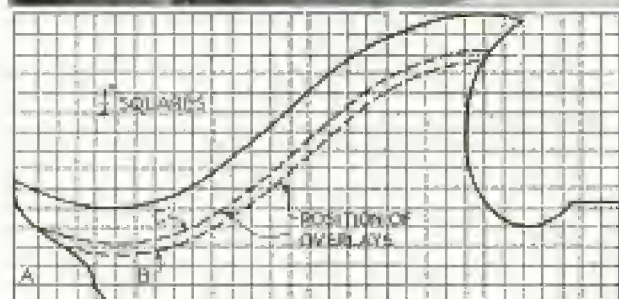


FIG. 1

Graceful Curves Add to the Beauty of This Mirror

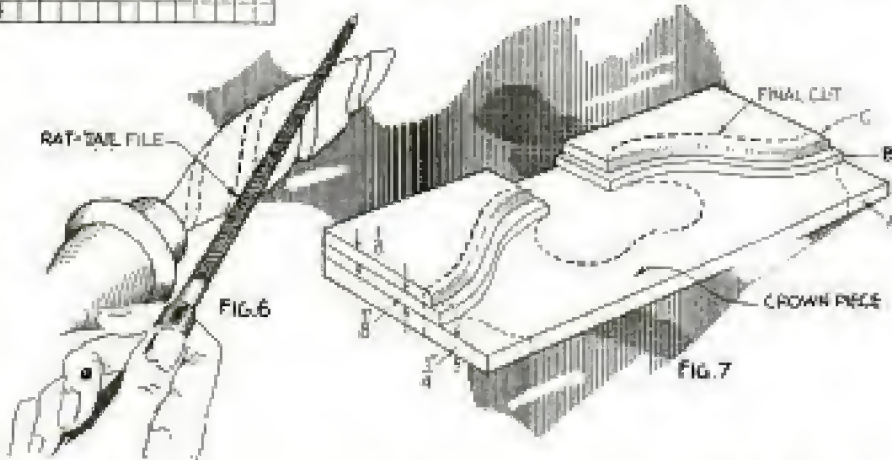
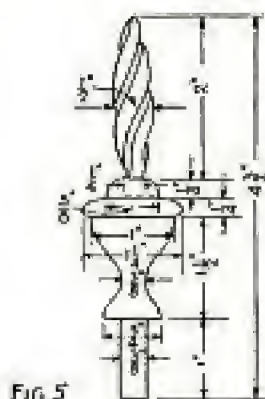
No nails are used to fasten the frame together, as the head and bottom scrolls are to be set into grooves cut into the top and bottom members after the frame is glued up. For this reason, the frame must be reinforced with wood splines. The photo at the upper corner of page 1011 shows how the saw kerfs for the splines are cut on the circular saw. Care must be taken to have the same face of each piece next to the fence, so that the cuts will line up. The cut should be about  $\frac{3}{16}$  in. wide and the spline pieces should be made to fit snugly with the grain running across the joint. Fig. 9 shows a spline in place and also the method used to glue the frame together. Triangular blocks, called "ears," are temporarily





glued onto the frame at each corner, in about the position shown in the figure. After they are dry, glue is applied to the joints and worked into the end grain. The splines, too, are glued and then slipped into place on all the corners, and the frame assembled. C-clamps or hand screws, applied to the ears, are used to draw the joints up tight and the frame true. Do not attempt to trim off the splines where they extend beyond the frame until the glue has set. The ears can easily be split off with a sharp chisel, after which the places where they were attached may be smoothed down. The  $\frac{1}{4}$  by  $\frac{1}{4}$ -in. grooves for the top and bottom scrolls should be cut on the circular saw either by making several kerfs or by using a dado head. These grooves are shown in the side view of Fig. 1.

The heading is of the broken-arch type, and as the home-workshop equipment usually does not include a shaper, the writer suggests a method by which a curved molding can be made by using a band, jig or scrollsaw and building up the molding. It consists of three pieces, as shown in Fig. 7. The back piece is cut to a size of 4 by  $15\frac{1}{2}$  in., and the pattern shown in Fig. 2 marked on its surface. Two pieces, the shape of which is given in Fig. 3, are next cut, the edges carefully smoothed and the pieces glued into place as shown by the dotted lines in Fig. 2. Two more pieces are made to conform to the dotted line C of Fig. 2, and the curved edges of these pieces are cut to a quarter-round with a medium grade of sandpaper. Care must be taken to keep the same contour as line B, as it is obvious that the spacing must be equal the full length of

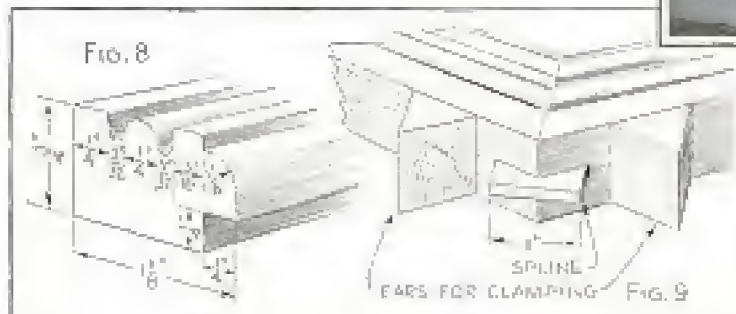


Without a Molding Cutter You Can Build Up Realistic Imitation Molding from Pieces Cut on a Bandsaw



the curves. Glue these pieces into place and allow to dry. The final cut is made along the dotted line shown in Fig. 7. The bottom scroll is made without molding or other form of ornamentation, so requires no special explanation. A pattern for this piece is shown in Fig. 4. The thickness of the stock also is  $\frac{1}{4}$  in. and plywood is preferable for it as well as for piece A, Fig. 7.

After the heading and bottom scroll have been glued into their grooves all that remains to be made are the block,



cap and flame-and-turn ornament or finial, which gives the final touch of beauty to the mirror. The block is simply a  $\frac{3}{4}$ -in. plinth in which a notch has been sawed, allowing it to slip over the heading. The top of this block is covered by a little  $\frac{1}{8}$ -in. cap with slightly rounded edges. A  $\frac{3}{8}$ -in. hole is drilled through this piece and into the block to a depth of 1 in. to receive the dowel on the end of the finial. The dimensions for these pieces are given in Figs. 1 and 5. The finial is turned out on a lathe. Care must be taken to make very light cuts with sharp tools because of the slenderness of the piece. The smaller diameters should be made last for the same reason. The spiral cuts on the flame part of the ornament should be marked out with a pencil, then cut with a small rat-tail file, as shown in Fig. 6, unless you are proficient in the use of carving tools.

Apply one coat of a solution consisting of bichromate of potash, 1 part, and water, 3 parts. When dry, lightly sand with No. 00 sandpaper and follow with a coat of mahogany water stain, a coat of paste-wood filler and two or three coats of white shellac. Sand between coats and rub the final coat with powdered pumice-stone and paraffin oil. After the finishing is completed, gild the bead next to the mirror with old-gold bronzing liquid. You

must be sure to gild the rabbet in which the mirror rests also, as the reflection of this surface shows in the mirror quite plainly.

### Vegetables Sprouted in Cellar

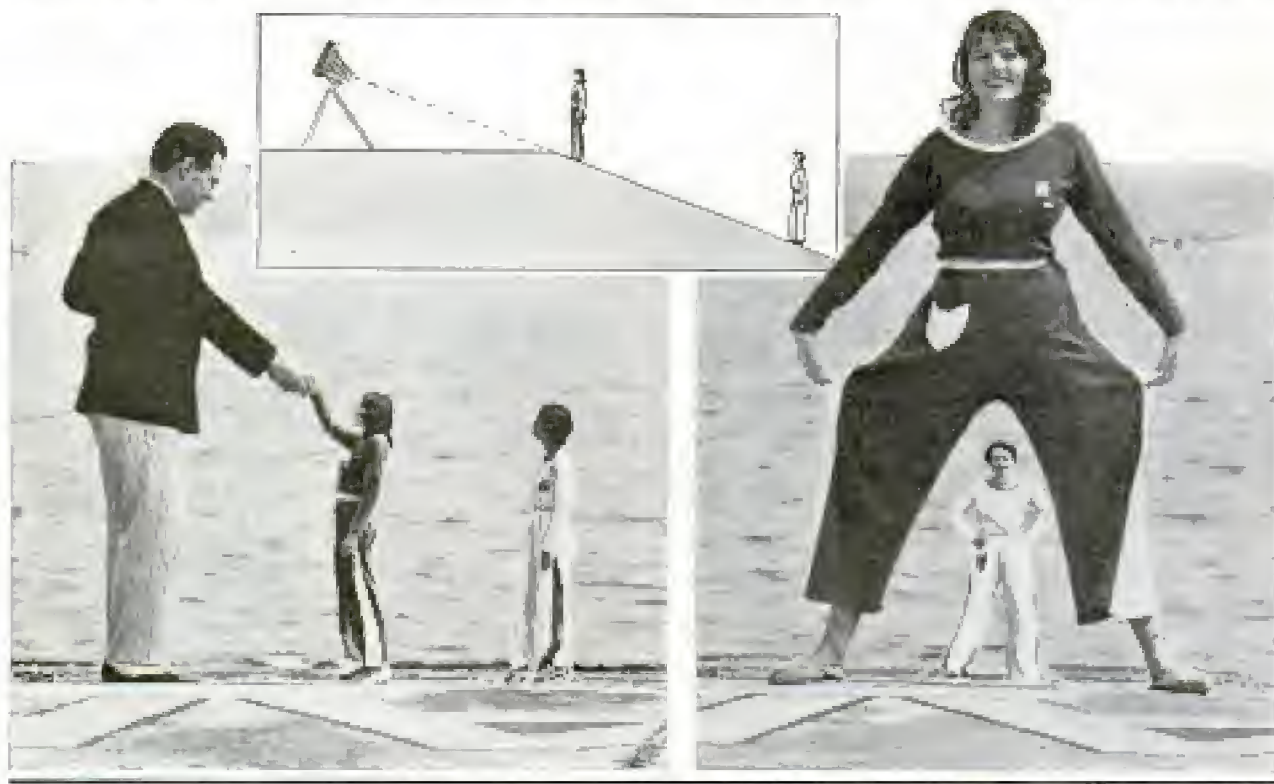
If you have a well-lighted and warm cellar, or some extra space in the kitchen, you can grow vegetables during the winter. A few pans and one or two small wooden trays to sprout all kinds of beans, peas, corn and smaller grains are needed. For beans, spread a thin layer in a tray, moisten and add a little sand to hold the roots in place. When the sprouts have formed about four leaves, cut them off just above the roots, or remove the whole plant. Onions are sprouted similarly, but are slower, each bulb growing three or four shoots, which will be tender when they reach the size of a lead pencil.



In the Basement, Fresh Vegetables Can Be Had During Winter Months



# Trick Photos Resemble Double Exposures



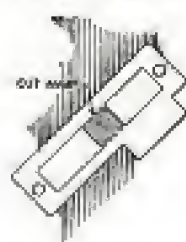
Snapshots That Resemble Double Exposures Can Be Made with Any Camera, Stopped Down to Obtain a Sharp Focus of Objects Placed at Various Distances from the Lenses

By taking advantage of the natural topography, trick photos that resemble double exposures can be taken with an ordinary camera. Those illustrated were taken on an incline—a seaplane ramp in fact. The camera was mounted on a tripod and set at an angle parallel to the slope. The camera lens was stopped down to F.16 or less in order to get a sharp focus, and the exposure was timed accordingly. The subject to be taken big was placed about 20 ft. from the lens while the one to be taken small was placed farther down. The illusion of shaking hands was obtained by looking into the finder of the camera and making sure that the hand of the close-up subject was in front of the hand of the more distant one. This part of the stunt must be carefully done so that the secret will not be given away. While pictures may be made of such a variety of subjects as a giant stepping into a tiny airplane or boat on such a ramp, the ordinary city street or country road provides adequate facilities for equally ordinary pictures. For example, you can cure a picture of your bull pup

you, with the dog as big as an elephant and yourself Lilliputian in size. Houses at the foot of a hill and other objects often lend themselves to absurd and humorous pictures such as a snap of yourself putting your foot down on an entire village. No trick lenses, exposures or retouching are necessary, the only requirements being a tripod and a camera that will stop down to F.16 or F.32, or farther.

## How to Adjust the Lock Strike of a Sagging Door

Doors that have sagged so that the latch will not enter the slots in the lock strike can be cured by merely sawing out the metal that separates the two slots, and also chiseling out the wood between the slots in the door casing. This will provide enough space and the door will have to sag considerably before the latch catches again. In case the lower part of the latch catches, the slot of the strike can be filed a little deeper.





### Copper Strips Add to Efficiency of Car Heaters

Strips of sheet copper bent to form deep corrugations and clamped to the top of the exhaust manifold will greatly increase the efficiency of car heaters of the inexpensive type. Due to the great heat conductivity of copper, much additional heat is transferred to the air that passes through the heater. The strips encircle the manifold between its branches, and the ends are drawn together with small stove bolts.

### Improved Heater for Poultry Water Fountain

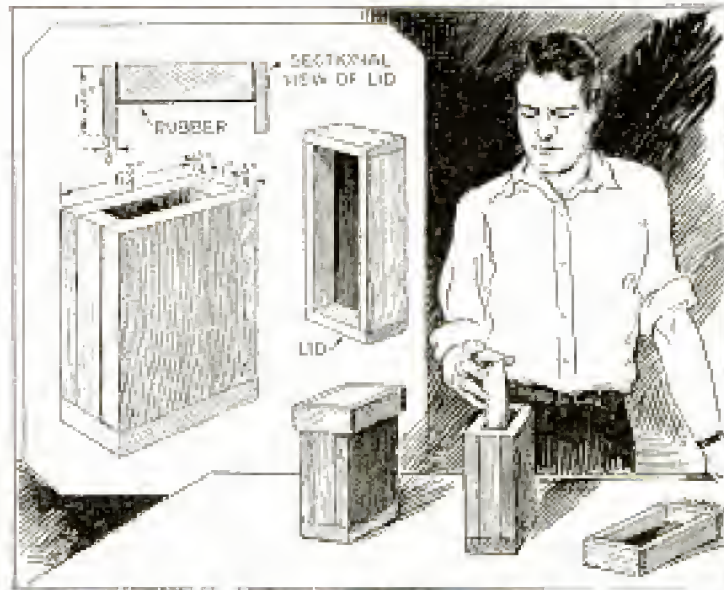
To provide a poultry water fountain, which would not freeze and could not be littered, a Wisconsin farmer soldered a portable fountain on top of an old 10-gal. milk can. An opening was cut in the side



of the can to permit the insertion of a lighted lantern which kept the water warm. A tin slide closed the opening, and a layer of concrete in the bottom of the can kept it from tipping over. A discarded auto tire rim, with four legs bolted to it to hold it within an inch of the drinking pan, was slipped over the can for the chickens to perch on while drinking.—Russell Bookhout, Madison, Wis.

### Chamois-Skin Lining Protects Watch Pocket

An octagon-shaped watch will soon wear a hole in a pocket, especially if the watch is heavy. To prevent this, a piece of chamois skin or durable cloth, which will not scratch the watch, is sewed inside the pocket. Besides saving the lining, this method will also keep your watch case polished.



Made of Wood and Holding a Few Films, These Midget Tanks Will Save Much of Your Developing Fluid

### "Midget" Tanks Will Save Developer

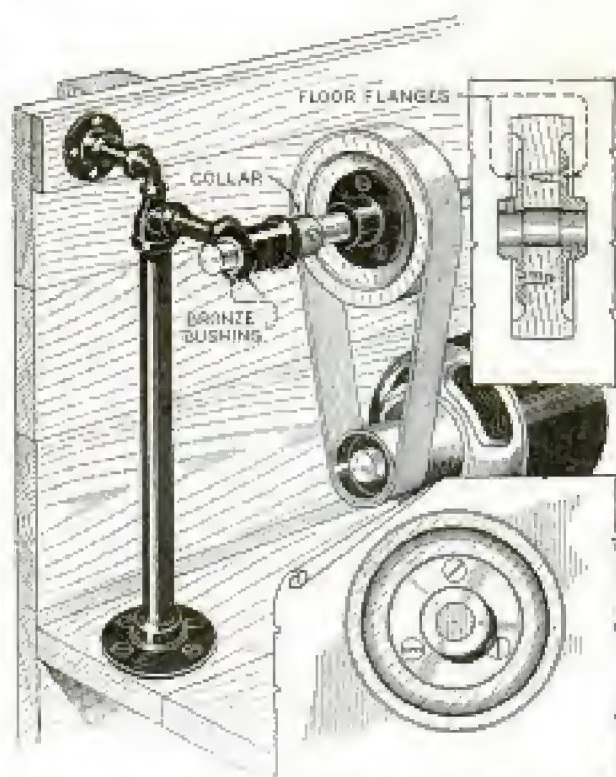
Much developing fluid can be saved by the home photographer who uses cut films and has only a few to develop at one time, by providing himself with a number of midget tanks. Constructed of wood, they should be 1 in. wide and of suitable length and depth to fit the size of films used. The inside is waterproofed with melted paraffin which is poured out before it hardens. Lids for the tanks are also made of wood and lined with rubber cut from an old inner tube.

### A Crane for Your Fireplace

A crane that will add to the attractiveness of a fireplace, besides being useful for holding a kettle, can be quickly made of  $\frac{1}{2}$ -in. iron rod and a piece of bar iron. Weld two lengths of the rod together and form the ends into a hook as shown. Then round off the free ends of the rod, bending them to fit into holes drilled in the ends of the piece of bar iron, which is also bent, and fasten the outfit to the rear of the fireplace with  $\frac{1}{4}$ -in. expansion bolts.







Self-Aligning Shaft Bearings, Supports and Pulleys Made from Pipe and Fittings

### How to Make Your Own Pulleys and Lineshaft Bearings

If you have a small lathe, you can easily make your own pulleys and bearings. They may be turned out of maple or birch, are recessed on each side as shown, and have a hole drilled in the center, slightly larger than the shaft on which they are to be used. Two cast-iron floor flanges, of suitable size, are faced in the lathe to fit the sides. The inside of the flange hub is reamed out to just slip on the shaft, and is then drilled and tapped for setscrews, with which it is fastened to the shaft. The three pieces are mounted on the shaft or mandrel, and the flanges screwed to the pulley with flat-head wood screws, staggering them on opposite sides. A coat of shellac applied before assembling the pulley, will prevent shrinking. It is also a good plan to take the finishing cut on the face of the pulley and crown it at the same time. For high-speed work, it may be necessary to balance the pulley by screwing flat-head screws into the sides. Self-aligning bearings and supports for a lineshaft can be made from pipe and fittings, which will provide an exceptionally rigid assembly and sufficient range of adjustment for any reasonable belt stretch. Run the threads back on the

pipe farther than is usually done, to allow a horizontal and vertical movement of about  $\frac{1}{2}$  in. for adjustment purposes. The bearing itself is a standard pipe tee, reamed to the proper size for a thin bronze bushing, which is held in place by a short headless setscrew at each end of the tee. File a flat spot on the bushing so it will not be necessary to tighten the setscrews enough to distort the bushing. After assembling, drill and tap a hole for a grease cup through the tee and the bushing. In assembling, the top of the "L" should be left loose, or the bearing could not align itself.—Paul C. Wright, Columbus, Ohio.

### Lime Deposit in Teakettle Removed by Freezing

Lime deposits on the inside of a teakettle can be removed by setting the kettle, empty, outside during freezing weather, or by placing it in an electric refrigerator and allowing it to freeze. This will cause the deposit to crumble almost to the consistency of fine sand which can readily be removed.

### Ruled Holder for Exposing Prints

To aid in determining the correct distance for a light when exposing photo prints a graduated holder is handy. The light and switch are fastened to one end of a board, about 5 in. wide and 24 in. long. Starting at the base of the light socket, lines are ruled across the board at 1-in. intervals and numbered. The correct exposure time for each distance is then readily obtained by making test-strip exposures and marking the time in each section.



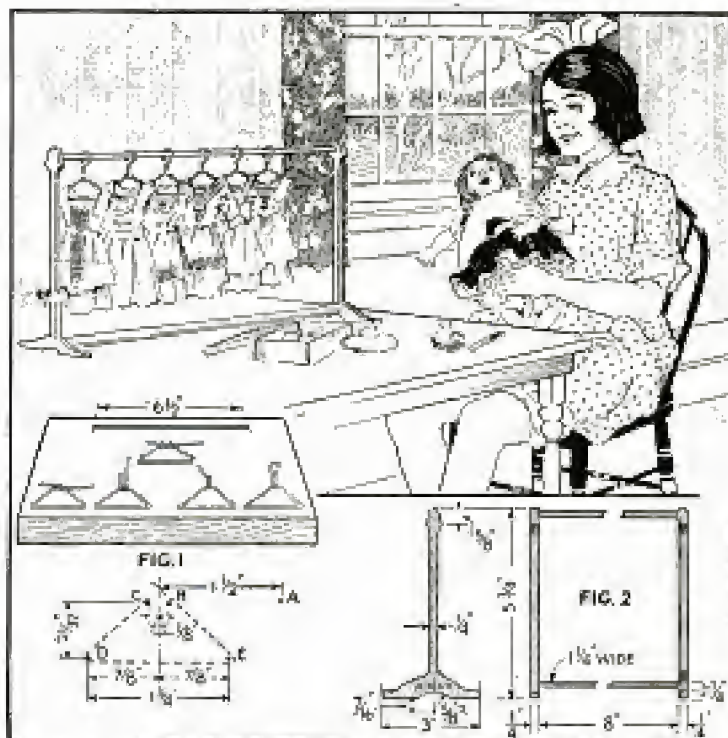
Ruled Board Fitted with Lamp Aids in Getting Photographic Prints Correctly Exposed



### A Rack and Hangers for Doll Clothes

This rack and hangers for dolls' clothes will make a pleasing gift for small children. The rack is made from wood taken from a cigar box. The two endpieces are cut to the shape and size shown, and have an 8-in. length of  $\frac{1}{4}$ -in. dowel rod glued between them at the top, and a piece of the plywood,  $1\frac{1}{4}$  in. wide and 8 in. long, similarly fastened between them at the bottom. The hangers are of wire and can be made as follows: Lay out five points on a board and drive small nails in the board as shown. Then cut them off about  $\frac{1}{2}$  in. above the board. Cut a busbar into  $6\frac{1}{2}$ -in. lengths and place one end of a length against the two nails and with a pair of pliers bend it around the nails.

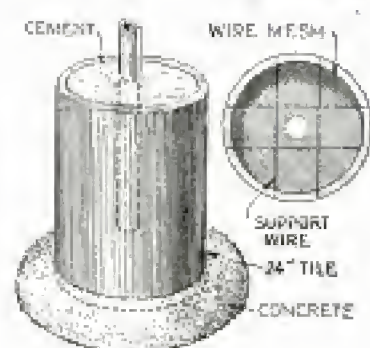
Then take the wire off the form and bend the ends up at the center, twisting them together until the short one gives out and



Small Children Will Have Many Amusing Hours with This Rack and Hangers for the Clothes of Their Dolls

the long one sticks out to one side, thus making the neck of the hanger.—L. M. Curtis, Jr., Tulsa, Okla.

### Filter for Shallow Well or Cistern



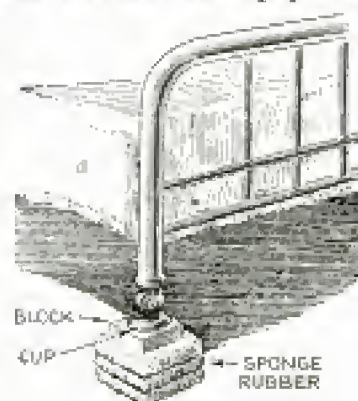
Owners of cisterns or shallow wells can have clean water by using the illustrated filter. First clean out the well, then make a concrete base directly under

the pump pipe, 15 in. in diameter and 2 in. thick, and set a 10 by 24-in. soft drain tile upright in it. After the concrete has set, drill a number of holes for No. 9 wire, about 2 in. from the top of the tile. Insert the wire in the holes and cut a piece of coarse-mesh wire screen to fit inside the tile. This is to support a concrete top over the tile. Then cut a hole in the wire to fit the pump pipe, and place the pipe in position. Pour cement over the wire and around the pipe, making it tight to prevent leakage of water around the top. The water will filter through the

tile fast enough to meet any ordinary demands on the well and has been found highly successful in actual use.—James A. Meece, Tuscola, Ill.

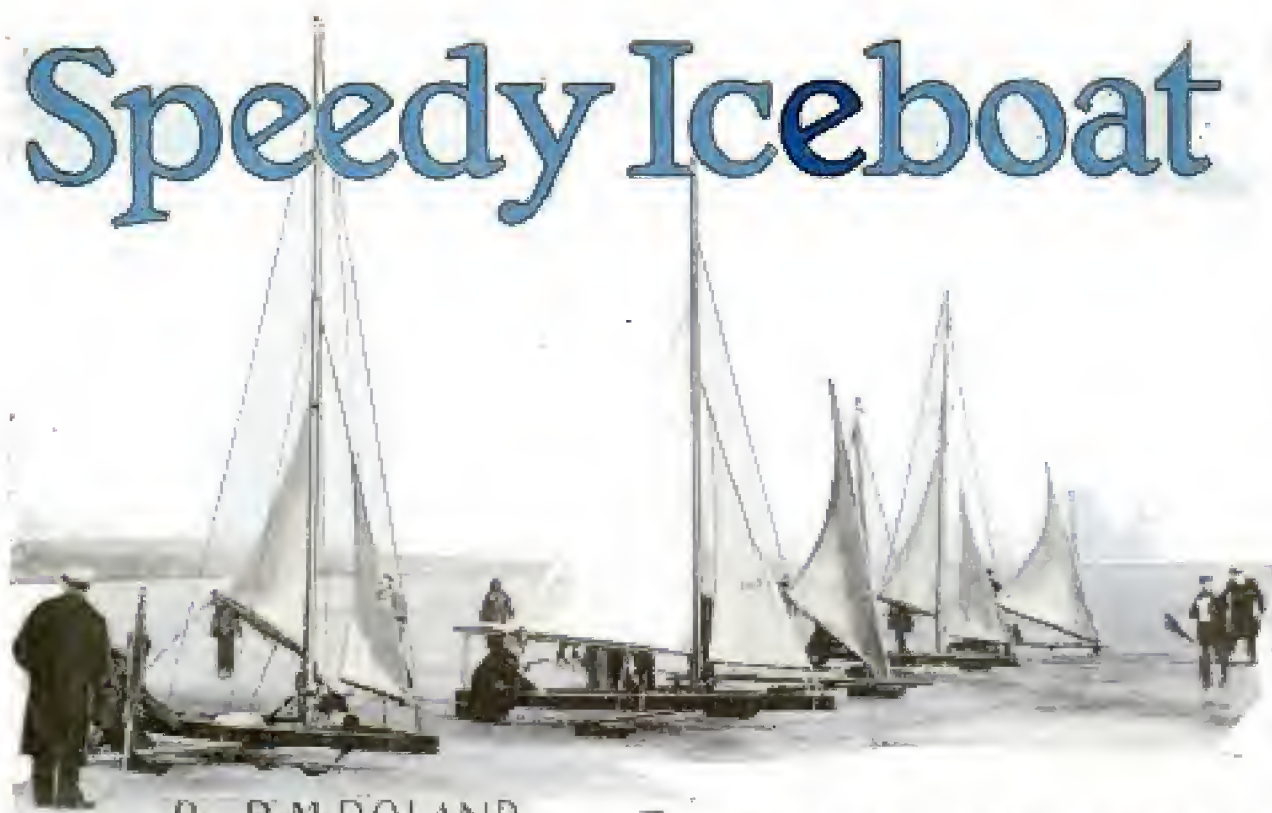
### Sponge Rubber Prevents Vibration of Bed from Heavy Traffic

Those living along streets carrying heavy traffic can eliminate vibration of the bed by placing sponge-rubber cushions under each leg. Cut the rubber into 4-in. squares and place three or four pieces on one another. A wooden block of the same size is laid on the top piece, and a caster cup is set on the block to prevent the caster from rolling off, although it is advisable to remove the caster and set the bed posts in the cups.





# Speedy Iceboat



By R.M.ROLAND

**C**APABLE of carrying four persons, and often more, this 18-ft. iceboat is especially adapted for small lakes, and can be towed along the road with your car.

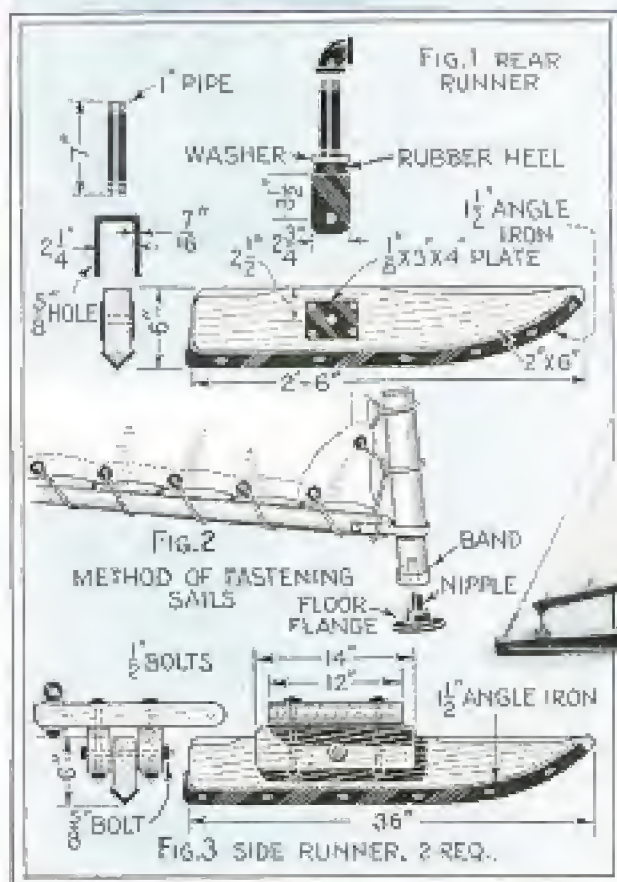
The frame consists of a center beam and crosspiece. Get a clear piece of pine, 4 by 4 in. by 17 ft. in size, and another piece 2 by 12 in. by 12 ft. The latter is attached 8 ft. from one end of the center beam, U-bolts being used for this purpose, as shown in Fig. 6. The bolts can be made from 11 $\frac{3}{4}$ -in. lengths of  $\frac{3}{4}$ -in. iron rod, threaded at each end. Pieces of  $\frac{1}{4}$  by 2 by 14-in. flat iron, drilled to slip over the ends of the bolts, are then placed on the underside and nuts driven on the bolts, lock washers adding security. As a base for the mast, screw a 1 $\frac{1}{2}$ -in. pipe nipple to the center beam just ahead of the crosspiece, and fit a 2-in. nipple in the flange. At the rear end of the center beam, a 1 $\frac{1}{2}$ -in. hole is drilled for the 1-in. rudder post, while  $\frac{3}{8}$ -in. flat-iron plates, about 3 by 4 in. in size, are screwed above and below the hole as indicated, to take the wear of the post. The plates are securely attached by using large flat-head wood screws, the heads being counter-

sunk flush. Details of the rudder are shown in Fig. 1. It consists of a piece of oak, 2 by 6 by 30 in. in size, cut to the shape shown, and the lower edge is beveled to fit the runner, made of 1 $\frac{1}{2}$ -in. angle iron, which is screwed on with flat-head countersunk screws. The holes drilled in opposite sides of the runners should be staggered, as they would weaken the piece considerably if drilled in line. Two 3 by 4 by  $\frac{1}{8}$ -in. plates are screwed to both sides, centering about 12 in. from the rear end, and a  $\frac{5}{8}$ -in. hole is drilled through the assembly as shown in Fig. 1. A  $\frac{7}{16}$ -in. U-piece straddles the runner at this point, its sides being drilled to match, and a hole is bored in the top to take the end of a 7-in. pipe nipple, which is welded on. Then a rubber washer, or "heel," and a metal washer are slipped over the pipe. The rudder post is pushed up through the center beam after which an elbow is driven on the nipple. A hole should be drilled through both elbow and nipple to take a pin which prevents the elbow from turning. Then the tiller is run into the elbow as shown in Fig. 7.

Oak is also used for the other runners, a detail of which is given in Fig. 3. These are 3 ft. long and are similarly fitted with angle iron which may be flattened at the upper end. Two 2 by 4-in. blocks are bolted to each runner through a hole 1 $\frac{1}{4}$  in.



# Seats Four

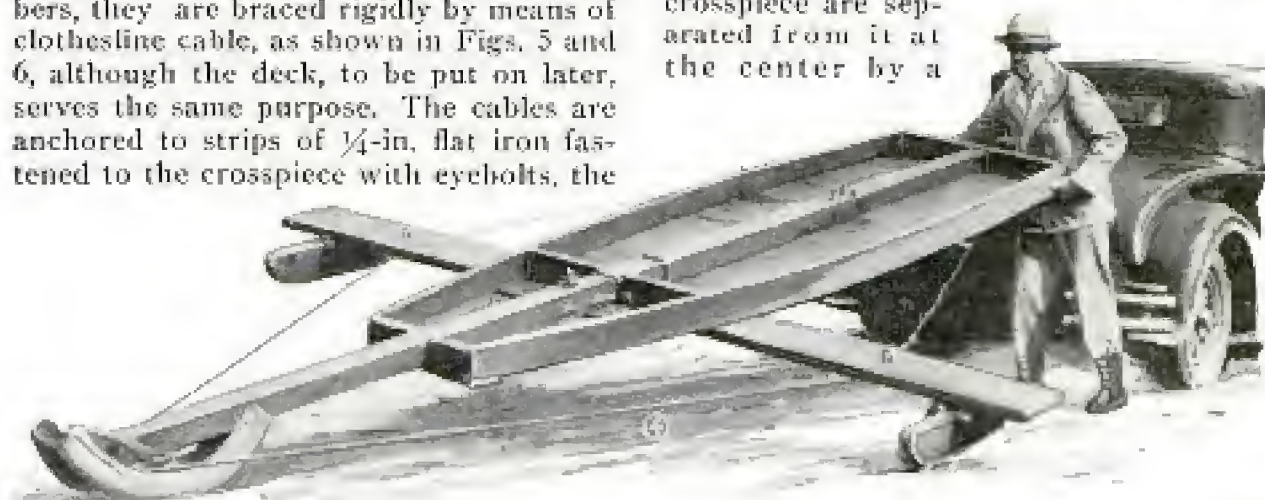


from the top and 14 in. from the rear end, and these pieces in turn are bolted to the crosspiece. Care must be taken to get the side runners parallel to each other, and the edges of all runners must be kept sharp, which can be done by touching them up with a file at regular intervals. To prevent weaving of the frame members, they are braced rigidly by means of clothesline cable, as shown in Figs. 5 and 6, although the deck, to be put on later, serves the same purpose. The cables are anchored to strips of 1/4-in. flat iron fastened to the crosspiece with eyebolts, the

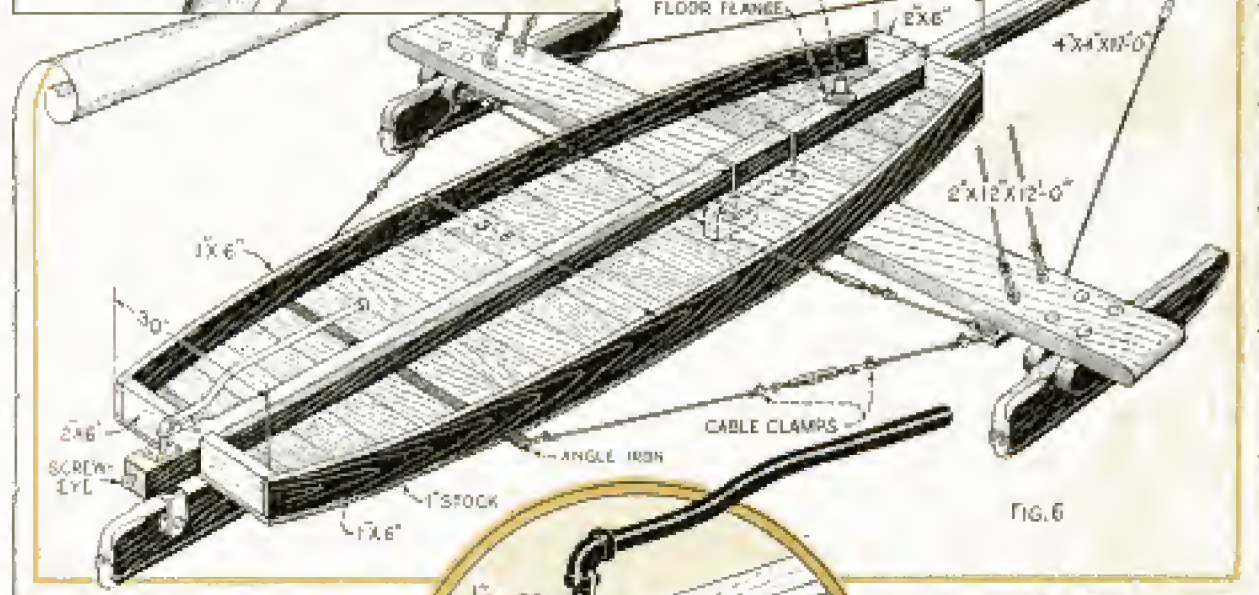
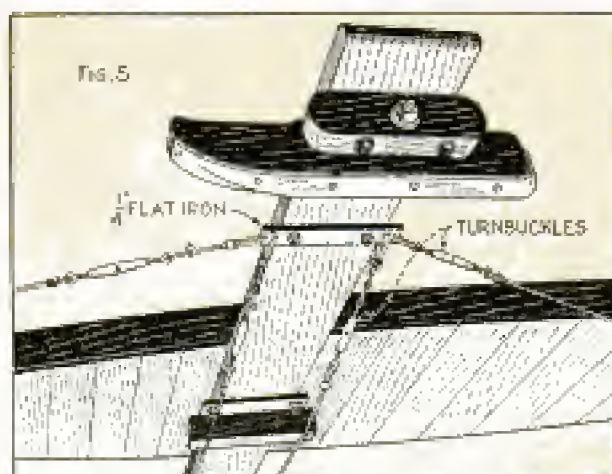


Although This Photo Shows a One-Man Boat, the Deck May Be Enlarged

eyes holding the lower ends of the mast stays. Eyebolts are run through the center beam to enable attachment of the diagonal cables. The ends of the cables are run through holes drilled in the anchor strips or through the eyebolts, doubled and then held in place securely by means of cable clamps. Turnbuckles on each cable allow adjustment for tension. The two parallel cables directly under the crosspiece are separated from it at the center by a



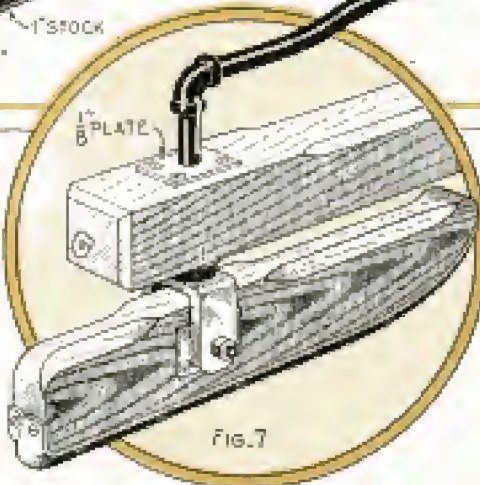




block, an arrangement which greatly strengthens the crosspiece against vertical strain.

The deck is now put on. It consists of 2 by 6-in. pieces at the front and rear ends, while 1 by 6-in. stock is used for the sides and bottom, which is screwed on last.

The mast should be 14 ft. high and  $3\frac{3}{4}$  in. in diameter at the center. The lower end is drilled to fit on the nipple, the hole being slightly oversize to allow a little play, and a ring or piece of strap iron is tightly drawn up around the lower end of the mast to reinforce it. The main sail is  $12\frac{1}{2}$  ft. high at the peak of the gaff and 12 ft. wide at the boom. The jib sail is  $5\frac{1}{2}$  ft. wide at the boom and 7 ft. high. The sails may be made of 8-oz. duck sewed three times at each seam, on an ordinary sewing machine. When com-



pleted, the sails can be taken to an awning shop and eyelets put in, or you can do this yourself. The sail is held onto the mast by means of rings and is fastened to the boom as shown in Figs. 2 and 9. A U-shaped piece of flat iron is bolted to the boom and slips over the mast, a lag-screw in the mast keeping it from being pulled up too far. Other details of rig-

ging are also shown in Fig. 9. When the boat is being towed, it should be arranged as in Fig. 4, with the rudder removed and a piece of old tire slipped over the dragging end of the center piece.

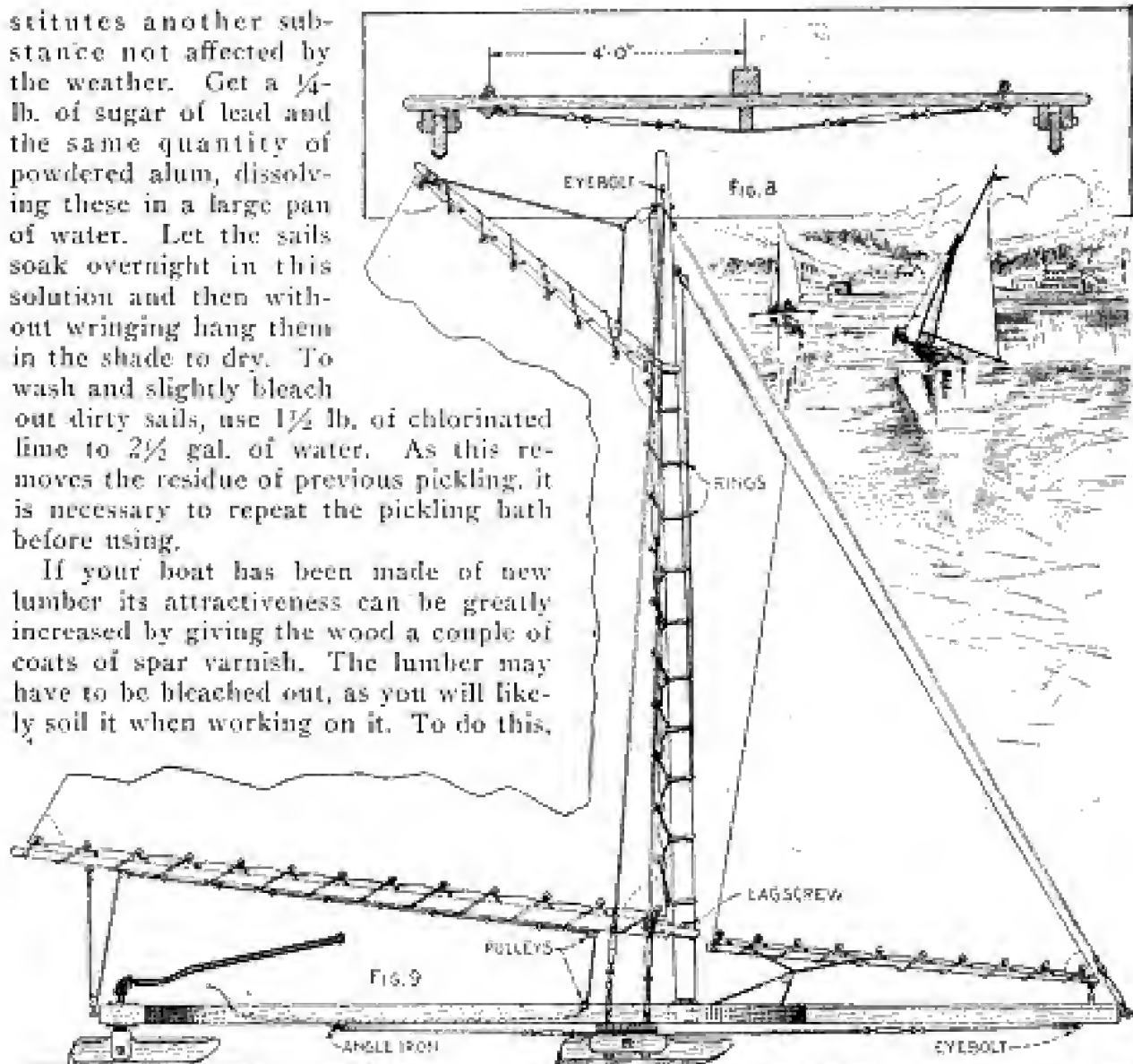
The mast should be well planed and sandpapered smooth, after which a couple of coats of spar varnish should be applied to protect the wood from the weather. The shrouds, or lateral guys, which lead in pairs to the masthead, should be of clothesline cable and also provided with turnbuckles to permit drawing them taut.

A word about the sails. The starch or size in new canvas, will, after being dampened, cause spots of mildew. In order to prevent such discoloration, it is a good idea to mildew-proof the sails in a pickling bath. This removes the size and sub-



stitutes another substance not affected by the weather. Get a  $\frac{1}{4}$ -lb. of sugar of lead and the same quantity of powdered alum, dissolving these in a large pan of water. Let the sails soak overnight in this solution and then without wringing hang them in the shade to dry. To wash and slightly bleach out dirty sails, use  $1\frac{1}{2}$  lb. of chlorinated lime to  $2\frac{1}{2}$  gal. of water. As this removes the residue of previous pickling, it is necessary to repeat the pickling bath before using.

If your boat has been made of new lumber its attractiveness can be greatly increased by giving the wood a couple of coats of spar varnish. The lumber may have to be bleached out, as you will likely soil it when working on it. To do this,



mix up some crystals of oxalic acid, using a tablespoonful to 1 qt. of hot water and stirring well to dissolve the crystals. After this solution has been applied to the wood, it should be neutralized with vinegar before proceeding with the finish. The raised grain can be sanded down and the wood filled, which should be allowed

to dry for 24 hours, before applying the first coat of varnish. Varnishing should not be done during cold weather as it will not spread evenly. For this reason it is best to varnish the parts separately indoors where the temperature is at least sixty-five degrees, and assemble them later when dry.

### How to Make Glow Pictures

Glow pictures can easily be made as follows: Dissolve in 2 fluid oz. of hot water, saltpeter, 2 oz., pulverized gum arabic, 1 oz. When cooled, this solution will have the consistency of jelly, but is readily liquefied by placing the container in a pan of warm water. With a pencil, draw a picture on a sheet of thin white paper, being careful that all lines connect and that they are not too close together.

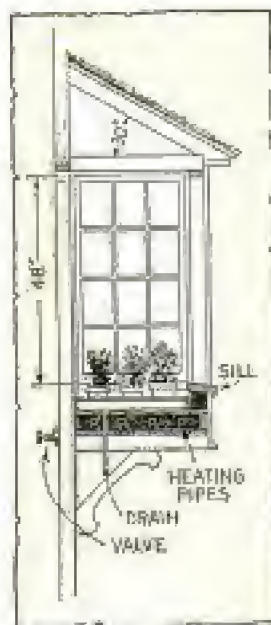
Then, using an ordinary pen, trace over the drawing with the solution, allowing the finishing line to come to the edge of the paper so that it can be ignited. To do this, scratch a match, immediately blow it out, and apply the glowing end to the line at the edge of the paper, which will ignite the glow solution and start a smoldering fire that will not cease until the design has burned out.—E. Perry, Oakland, Calif.



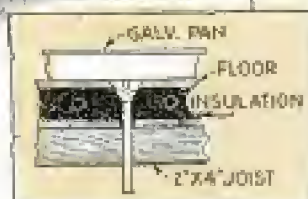
# Conservatory in the Dining-Room Window

**D**ESPITE the approach of zero weather you can hold captive a delightful bit of summer by installing this conservatory in your dining-room window and filling it with favorite blooms. It can be built at a nominal cost in any double-window opening on the south side of the house, with very little patching up on

ble purpose of preventing too much heat on the underside of the flowerpots and of eliminating wasteful radiation. Thus the soil will be kept at about the same temperature as natural soil in summertime. Continue with the framing and make the roof conform to that of your house, whether shingle, slate or tile. The side-window sash are set in permanently, but the two in front are made to swing out. Also make allowance for storm sash during extremely cold weather, and for screens for use

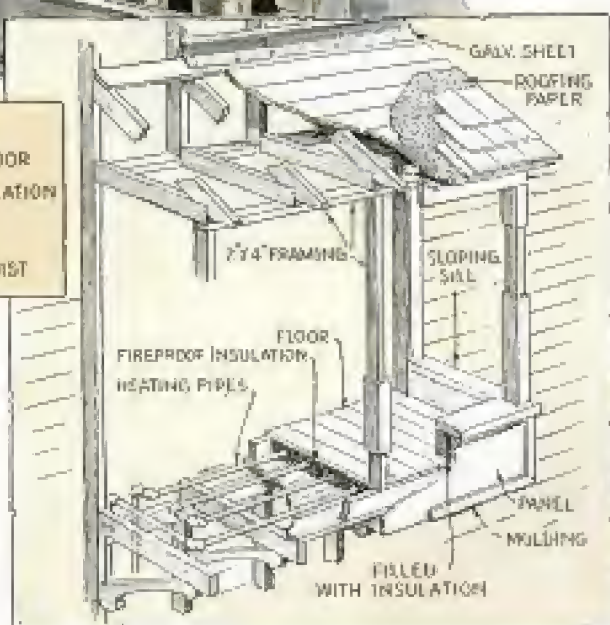


Built at Nominal Cost, a Window Conservatory Keeps Flowers in Bloom and Fragrance during the Winter; in Spring They May Be Transplanted to the Garden



the inside. If there already is a bay, it can be adapted to a conservatory by fitting a heater in a double floor as shown in the drawing. Complete dimensions are not given because these depend on each individual case, but, to simplify the work, it is best to design the heating installation to fit between four or more studs, which are usually spaced 16 in. apart on centers. The drawings illustrate one built between five studs, and 30 in. deep.

First set the floor joists and braces underneath, and lay the subfloor of matched lumber. Next fit in the heating pipes, assuming you have hot-water or steam heat, with the valve set in a panel in the side of the wall near one corner. Block up the pipes so that there will be a slight drop toward the return, especially in the case of steam, and cover them with commercial insulation. This serves the dou-



during the fly season. If you wish, the plants can be transferred to the garden in the spring, the pan lifted out and a cushion substituted, making an inviting window seat.

For a galvanized pan it is best to leave a job of this size to the tinsmith. Have him make it with a rim about  $1\frac{1}{2}$  in. high, or more, depending on the individual requirements, with a drain near one corner. This is to be set in a funnel fitted in the



floor. Raise the opposite end of the pan slightly to prevent the accumulation of stagnant water after sprinkling, which can be done by shimming with slats of diminishing thicknesses, placed crosswise at 6-in. intervals under the pan.—Hi Sibley, Pasadena, Calif.

#### Imitation Metal Cover Painted on Auto Tire

Protection and beauty for the spare tire, as secured with a metal cover, can be imitated with paints that also serve as a preservative for the rubber. The side walls should be given a coat of black top dressing, and the tread coated with a good quality aluminum paint. As the aluminum reflects heat and light, the tire will actually be kept cooler than it would be without the paint.

#### Rubber-Tipped Gloves Help the Postman

Rubber tips sewed on the thumb and forefinger of a glove, as shown, will be helpful to those who must sort letters or papers outdoors, during cold weather. The rubber provides friction so that it is not necessary to take off the glove when engaged in this work.



#### Dropping Sash Weights Open Stuck Windows

Windows that stick can usually be opened by pulling down and suddenly releasing the sash cords. The dropping weights will give the window a sudden jerk, thus loosening it. Do not pull the cords too far, as too vigorous a jerk might break them.

Two or three tablespoonfuls of condensed milk poured through the valve stem of your bicycle tires will serve the same purpose as a never-leak solution.

#### Picture Frames from Film Packs



Old Film Packs, When Properly Decorated, Make Beautiful Picture Frames

You can easily make a number of beautiful picture frames if you have a film-pack camera. Take apart the metal frame of an empty film pack, properly trim and put the picture in it and reassemble the frame. If desired, a glass can be placed in front of the picture. The frame can be set in a horizontal position by bending a length of wire to form a bracket and bolting it to the frame. Then enamel or lacquer the frame any color to suit your fancy, and the frame is ready for use.

#### Thumbtack on Cork Forms Pen "Primer"

It is often necessary to press down on the point of a steel pen to start the ink flow. By driving a thumbtack into the cork of the ink bottle as shown, a smooth metal surface is always handy to serve as a pen "primer" and the tack is in the bottle when it is set aside.





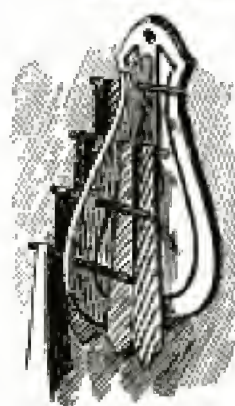


Efficient Homemade Snow Sweeper Made from a Discarded Rotary Brush and a Two-Cylinder Engine

### This Homemade Snow Sweeper Is Motor-Driven

Tired of removing snow with a shovel, an eastern man devised the motor-driven sweeper shown here. The chassis was made from the frame of a baby carriage. Two lawnmower wheels were fitted at the rear and two cart wheels at the front. The rotary brush was one discarded by the city street-cleaning department, and was driven by a small two-cylinder motor to which it was connected with a bicycle chain and sprocket gear. An automobile muffler to reduce noise and a few other refinements were added.—Jacob Deschin, Hartford, Conn.

### Rack Holds Your Ties Separate



Sawed from 1-in. stock, this tie rack can be made in any size and design to give an artistic effect. It consists of two pieces, fitted together at right angles. The back is drilled at the top for a nail with which it is fastened to the wall, while the other piece is drilled to receive short pieces of dowel rod.—George Haas, Chicago.

### Camera Tricks for the Home Movie Maker

Many exciting and novel home movies can be made by using a few simple tricks with the camera, such as reverse action. For example, take a picture of some one diving from a springboard in the usual way. Then have them repeat the dive and photograph it with the camera upside down. After the film has been developed, cut out and reverse the latter section end for end and cement it back in place. When the picture is projected, the diver will dive into the water and then jump from the water back to the springboard. Another good trick is to take a reverse picture from the rear of a rapidly moving train. Treat the film in the same way, and it will have the appearance of being filmed from the front of the locomotive. Set the camera, and, while it is running, have some one drive a car over it, making sure, of course, the car will clear it by a good margin. This film will have the appearance of a car being driven right into the audience.

### Locks for Water Valves

Here are two effective methods of locking water valves. Small ones can be locked by using ordinary extension locks. If the valve is too large to be locked in this manner, a length of rod can be bent to a U-shape with eyes at the ends and used in connection with a padlock, as shown in the illustration.



### How to Ground Washing Machine to Avoid Shocks

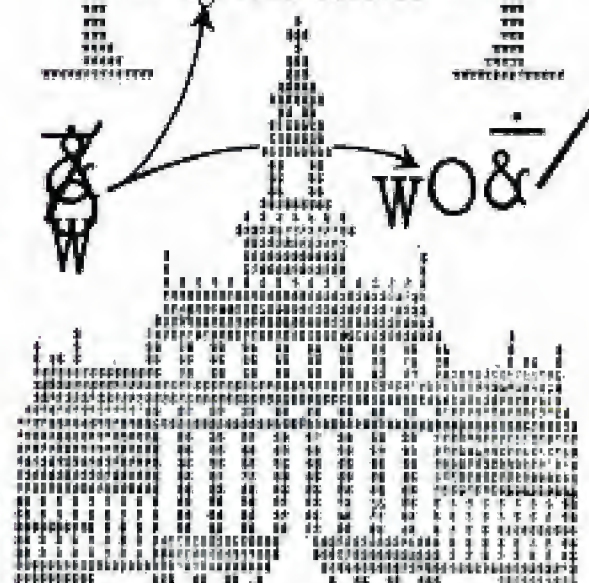
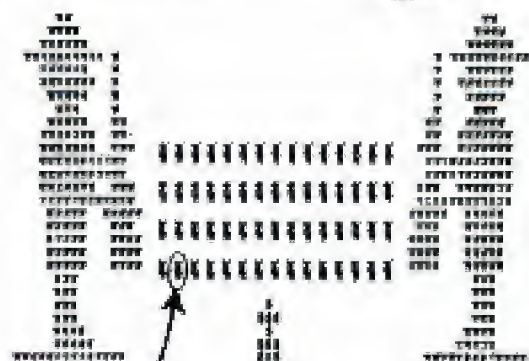
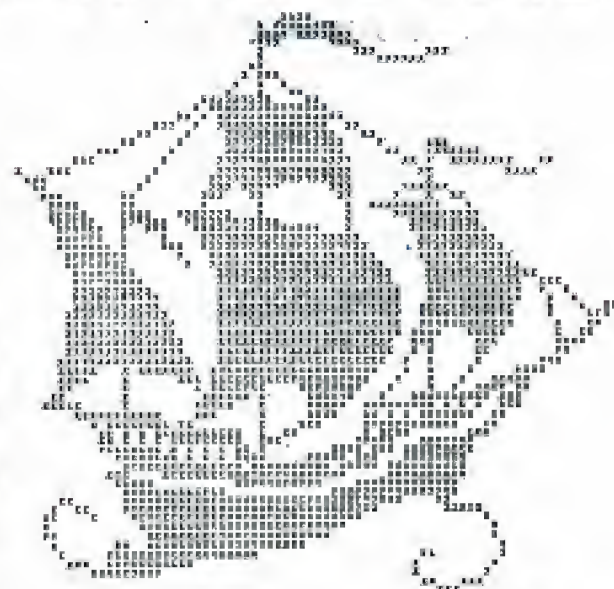
Motors on some electric-washing machines are grounded to the metal frame, which may cause unpleasant and dangerous shocks, especially on wet basement floors. This can easily be avoided by attaching a length of flexible copper wire under a bolt head on the machine and grounding it to a cold-water pipe.



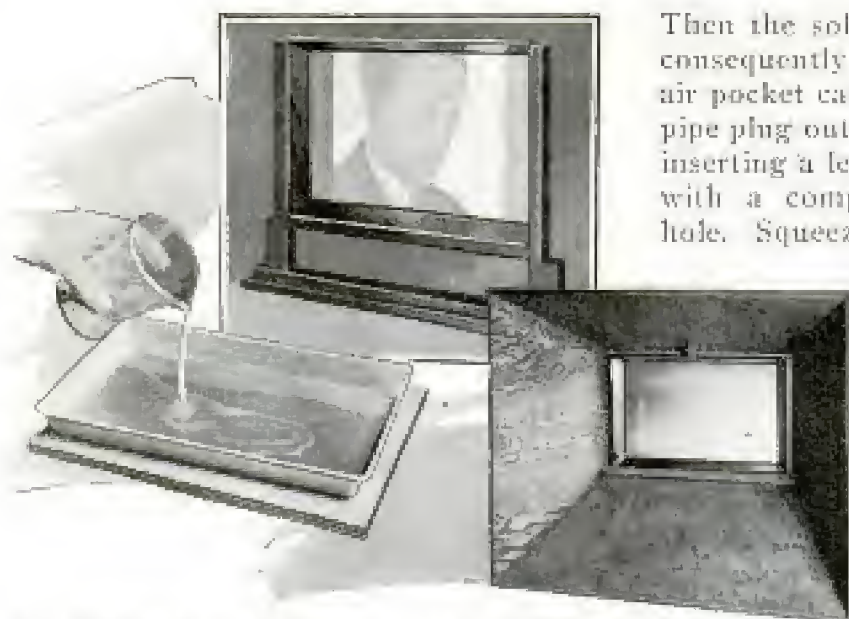
# TYPEWRITING ART

By Floyd Mix

**T**YPEWRITING art is not only an interesting pastime, but students in business schools will find that a silhouette and border will add materially to the attractiveness of their "budget" covers. Another practical application of this idea is the making of cross-stitch designs for embroidered work. First draw a light pencil outline of the project you have in mind and then select some letter or character that tends to form a solid mass when closely spaced by rolling the platen slightly off the regular line. Starting at the top of the rough pencil design, fill in the space as neatly as possible. The attractiveness of the design can be increased by using various characters and a two-color ribbon; also by leaving suitable blank spaces, these being an important factor in the larger designs. It is sometimes necessary to use two or more characters as in the small soldiers. Note the reproductions of Independence Hall and the DeWitt Clinton train.







Home-Movie Screen Made from Aluminum Baking Pan Reflects Small Images Suitable for Six or Eight Spectators

### Home-Movie Screen from Aluminum Baking Pan

Thoroughly cleaned on the inside, an aluminum baking pan, about 9 by 12 in. in size, will make an efficient screen for home movies where a small image is satisfactory. Fill the pan to a depth of  $\frac{1}{2}$  in. with a strong lye solution, allowing it to stand for 30 minutes. Then empty, rinse, and scrub off the resulting dark deposit with a wet cloth. This will leave a finely matted surface that is very efficient for a screen. The sides of the pan should be painted black on the inside. For use in a darkened room, the pan may be supported on a small wood frame resting on a suitable base or fastened to the wall. By placing a pyramid-shaped hood, made of  $\frac{1}{4}$ -in. veneer or wallboard, about the pan and painting it black on the inside, brilliant images can be obtained in an illuminated room. The small opening should be of the same internal size as the outside of the pan rim. If the larger opening is 8 in. greater than the small opening for a hood measuring about 10 in. deep, the proportions will be about right.

### Cure for Air-Clogged Auto Heater

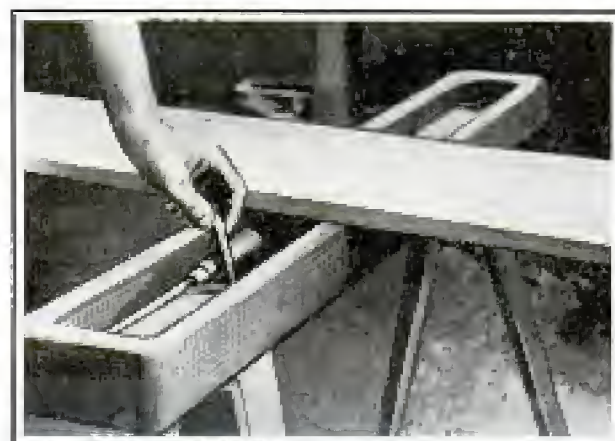
Auto heaters of the hot-water type frequently become air-clogged particularly if anti-freeze solution is allowed to drop too low and the radiator has to be refilled.

Then the solution will not circulate and consequently little heat is produced. The air pocket can be destroyed by taking the pipe plug out of the top of the heater and inserting a length of small copper tubing, with a compression coupling, into the hole. Squeeze the open end of the tubing together, leaving just enough space to allow the air to escape. Then place the end of the tubing in the drain provided for the cowl ventilator, or if there is no such drain, run it through the dash to the motor side and down to the pan, making sure that the point where it goes through the dash is several

inches higher than the top of the heater, or the solution may siphon out. This method is particularly effective on cars not equipped with a circulating pump, although it will better the results on any car. Another way of improving these heaters is to tap the top water manifold for a  $\frac{3}{8}$ -in. nipple near the front cylinder. The hose running to the top connection on the heater is then attached to this nipple instead of to the adapter. The hole in it is rather small and more solution will circulate through the heater via the nipple.

### Carpenters' Sawhorse Has Box for Holding Tools

Sawhorses can be made more useful by providing them with a tool box. Built of



The Top Cross Member of This Horse Is a Box for Holding Tools



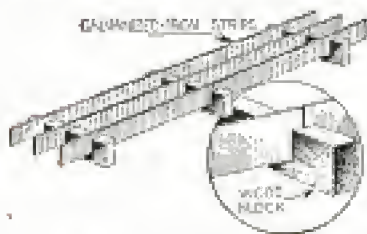
1-in. stock, the box, which is 3 by 6 by 36 in. in size, forms the top member of the horse. The legs are made of the same material, fastened to the bottom of the box and braced in the usual way. If furniture or other finished work is to be handled on the horse, it is a good idea to cover the box with old carpet or canvas to prevent marring the work.

### Parting Metal by Drilling

When material is to be parted by drilling a series of holes through it, time can often be saved by drilling one hole through the edge of the work. It will be necessary to hold the work at right angles to the drill-press table, which can be done by means of angle plates, so that a drill, almost as wide as the thickness of the work, can be run through.

### Toy Track Made of Sheet Metal

When you need more track for your toy train, a good substitute can be made from strips of No. 24 gauge sheet metal and wooden blocks,  $\frac{1}{2}$  by  $\frac{3}{4}$  by  $2\frac{1}{2}$  in. in size. Three sawcuts, spaced the correct distance apart and  $\frac{3}{8}$  in. deep, are made in each tie and the sheet-metal track, which is cut in 30-in. strips,  $\frac{5}{8}$  in. wide, is then tapped down into the sawcuts. Use a hacksaw in making the cuts as they will then be just wide enough to make a snug fit for the strips. The joints at the ends of the tracks should not occur on the same tie, and the ties should be spaced about 5 in. apart. A 40-ft. length of such track was made for \$1.



### Cleaning Commutator with Ink Eraser

To clean commutators without scratching the metal, fill a small, shallow container with carbon tetrachloride and dip a soft ink eraser into it, then rub the commutator firmly with the moistened end of the eraser and polish it with a cloth also dampened in the liquid. The eraser should be dipped into the liquid from time to time as it begins to dry.

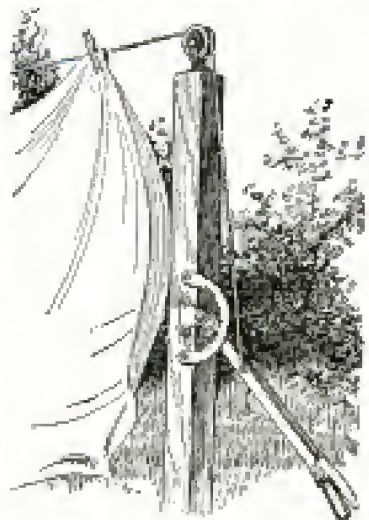
### Stilts Aid in Washing Walls

Strapped to the feet, these stilts will prove to be time and labor savers in cleaning walls and ceilings. The stilts are made of  $\frac{3}{4}$ -in. stock,  $7\frac{3}{4}$  in. wide and from 15 to 20 in. high, depending on the height of the work. A spread of 12 to 15 in. should be allowed for the feet to assure a safe balance. A discarded pair of shoes can be nailed on the tops instead of the straps if desired. Rubber snubbers may be placed on the bottom of the legs to prevent marring the floor.



### Brake Lever Used to Tighten Clothesline

An emergency-brake lever from an old model-T Ford, or a lever from a discarded machine, makes a good clothesline tightener. The lever and ratchet are fastened to the post as shown. The clothesline is run over a pulley mounted on top of the post and is fastened to the lever at the point indicated. In use, the lever is raised to slacken the line, and the clothes hung up, then pulled down to tighten the line.



☛ Dirty candles can be cleaned with a cloth wet with alcohol.





# THE BEAUTY of

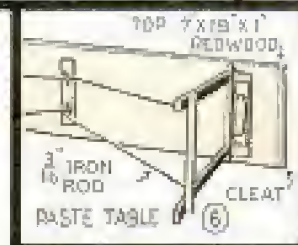
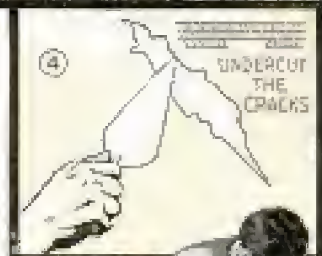


# and how

**N**OTHING can so quickly and artistically change drab, unsightly walls into panels of sparkling beauty as wallpaper. Note the difference as shown in Figs. 1 and 8.

Getting started is simply a matter of preparing the old walls for their new covering. Often this means only pulling away loose bits of paper. If the old paper is spotted or stained at any place, a hot iron applied over a piece of blotting paper, as shown in Fig. 3, will usually remove the discoloration. Damp spots can be effectively prevented from coming through by covering the wet area with sheet tinfoil, although a coat or two of shellac will serve the same purpose. All cracks in the plaster must, of course, be filled up before the new paper can be put on. In doing this with plaster of paris or patching plaster, be sure to undercut the opening, as shown in Fig. 4, so that the filling material can take a good hold.

It's easy enough to build the paste ta-



ble shown in Figs. 5 and 6, and cheap enough to purchase the two necessary brushes—a paste brush, and a smoothing brush, as pictured in Fig. 10. You will also need a sharp razor blade or a base trimmer to cut the paper, a bucket for the paste, a pair of large scissors, a pencil and a yardstick. Good paste can be purchased ready to mix with cold water.

Put the ceiling on first. Before starting the hanging, however, snap with chalkline or rule a line 17½ in. out from the wall as a guide for the first strip, as shown in Fig. 11. Since the average paper is 18 in. wide, this will leave a slight margin to turn down on the side-walls. The necessary length for the ceiling paper is then determined, allowing about 1 in. at either end to turn down on the sidewalls, and six or seven strips are cut to this size and placed, blank side up, on the paste table. In pasting the paper, start at one end and cover about two-thirds of the strip, keeping the edge of the paper nearest you flush



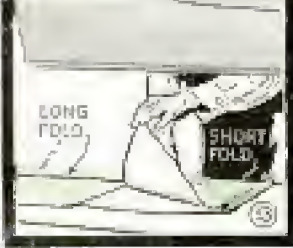
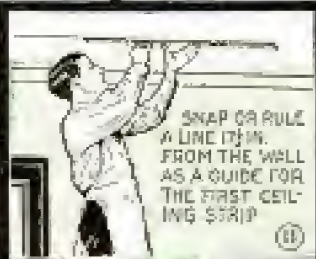
# WALLPAPER



## to apply it

with the edge of the table. The pasted portion of the paper is then folded, as shown in Fig. 12, after which the rest of the strip is pasted and folded in like manner, as shown in Fig. 13. The first fold is the longer of the two and is known as the long fold. The second and final fold is known as the short fold. The long fold is always the top of the paper and should be opened first when applied to the wall or ceiling.

The actual hanging is next. Fig. 2 shows the start of the operation. The long fold has been opened out, which is done immediately after mounting the scaffold, and the paper is held in position with a small roll of paper, carried in the left hand. Notice that the corner of the paper is turned back over the right hand, while the palm of the hand is flat against the ceiling. This corner is set to the line, while the left hand, with the roll of paper, is drawn tight and likewise set on the line. If the paper is set true on the line both at the right and left hand, you will find



no difficulty in sweeping it straight and true across the room. Now, push your right hand over and back toward the corner to temporarily fasten the paper, then get out the smoothing brush and sweep the strip through the center and on both sides. Continue brushing, keeping your eye on the line, until you reach the short fold; then put the brush in your pocket, and, with the right hand, open the paper by pulling down on the far corner, as in

Fig. 7. Finish brushing the paper to the end of the strip. Care, patience and ordinary common sense are all that is necessary. By the time you have put on three or four strips, always lapping each one over the one before, you will either have acquired the necessary technique or will be calling for assistance. There's no halfway mark.

When working on the walls the paper is pasted and folded as before, the long fold being the top of the paper. After folding, the strip is slipped over the right





arm and carried up the ladder. Fig. 14 shows how the strip is held preparatory to opening the long fold.

Notice that the thumb and first finger of either hand grips the corners of the paper, while the other fingers prevent it from unfolding. When you are properly stationed on the ladder, the last three fingers of either hand are removed and the long fold gently slides open. The paper is then set to a line or to the edge of the previous strip and smoothed on with the brush. The match is usually quite easy, being marked in most cases by arrows along the selvage of the roll. Fig. 16 shows the brushing-on immediately after the short fold has been opened, the



right hand holding the end of the strip while the brush is swept through the center of the paper. Each strip should be thoroughly brushed into the angle formed by the baseboard and the wall, and then cut off with a trimming knife, razor blade or circular base trimmer, as shown in Fig. 15.



Hanging walls presents a number of little problems. On no account should a full strip of paper be used to turn a corner. Rather, the paper should be cut so as to lap about  $\frac{1}{4}$  in. on the adjoining wall; then the rest of the strip can be brushed on, as in Fig. 17, with no danger of the paper wrinkling. Fig. 18 pictures the usual manner of papering around

windows and similar openings, the paper being carried over and under the opening without any mismatch. The strip saved from the left-hand edge of the window will fit in perfectly on the right-hand edge regardless of the size of the window or the dimensions of the piece cut out.

You will, of course, have to remove all lighting fixtures in order to fit the paper properly. Then tear the paper, as shown in Fig. 19, brushing it back to rematch the strip perfectly. On light-tinted papers, where a tear might be visible, the patching can sometimes be eliminated by







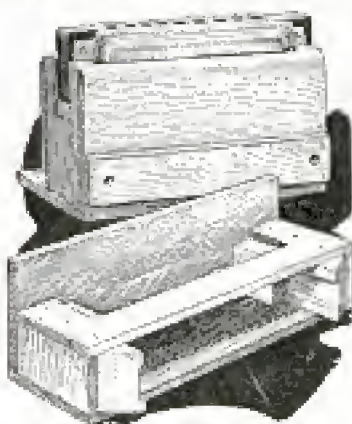
A Crib That Baby Can Propel Around Will Exercise and Aid in Teaching It to Walk

### Rolling Crib Teaches Baby to Walk

Two rolling pins, fastened to a supporting frame and used as casters, will make an excellent crib that will exercise and teach a baby to walk. A strip of canvas, suspended from the front and back of the frame, serves as a seat. The top should be well padded to prevent injury should the baby fall on it. Rubber strips would also prevent marring furniture.

### Sounding Board Improves Tone and Volume of Harmonica

Constructed by a person who was slightly deaf, this sounding board for a harmonica increased the volume of sound and improved the tone of the instrument.



The board was made from wood taken from a cigar box and its construction is clearly shown in the drawing. The braces on either end of the box were carefully cut, making a flange to prevent the harmonica from sliding all the way in, so that an air space would be provided to increase the volume of the

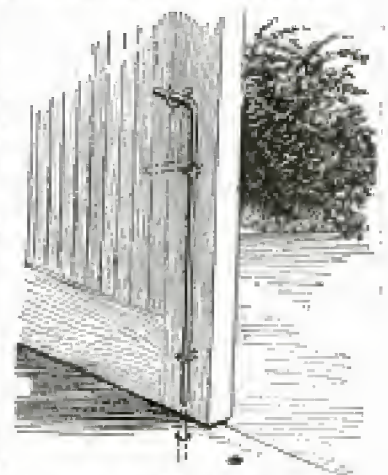
sound. The holes on the side, near the bottom, are for a wire brace which holds the instrument in place.

### Electroplating Lead Oxide on Iron to Protect It from Rust

By the use of a special solution, a thin, impermeable layer of lead oxide can be electrically deposited upon iron or steel objects to prevent rusting. The plating bath is composed of lead nitrate, 10 parts, and ammonium or sodium nitrate, 5 parts, dissolved in 100 parts of water. The object is first cleaned by dipping it in a boiling solution of lye, and then immersed in a 5-per-cent solution of sulphuric acid and water, in which it is allowed to remain for a time. It is then hung in the bath, a lead plate serving as the anode, a 2-volt current of 1 amp. per square foot of surface being used. Under these conditions the plating is completed in about 10 minutes. A larger current will shorten the time somewhat, but the coating will not adhere so well.

### Sure-Hold Garage-Door Fastener

Trouble experienced in holding garage doors open, can be overcome with this fastener. It is a 3-ft. length of  $\frac{1}{4}$ -in. iron rod with a right angle bent at one end for a handle. It is fastened to the door with screweyes in which it slides, one of the screws being opened and driven in a position to hold the rod up while closing the doors. A hole is drilled in the concrete directly under the rod at the point the door is to be held, and the rod is dropped into it as shown.—C. Purcell Scott, Los Angeles, Calif.



¶The odor of gasoline or benzine that remains on clothing after cleaning can be removed by sponging with water to which 6 or 8 drops of sassafras are added.

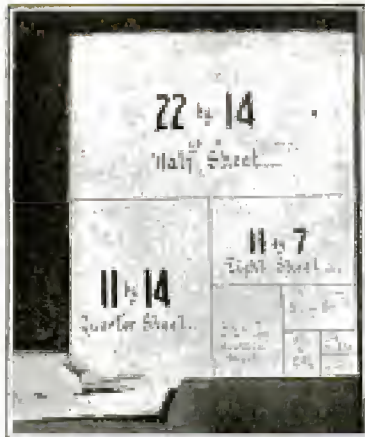


centering the strip at the opening and working on either side. This method is frequently used to avoid a tear in the ceiling paper around the central light fixture. In working around archways, the sidewall paper is cut in small segments to lap over the edge of the opening, then the adjoining sidewall strips are brushed on from the bottom up, cutting the paper at the necessary point to cover the half portion of the arch edge on that side, as shown in Fig. 20.

### Mirror for Checking Engine Timing

When it becomes necessary to check the timing of an engine, there is generally so much dirt on the flywheel that it is rather difficult to see the markings, even with a flashlight. By placing the car in the sunlight and using a mirror to throw the light onto the flywheel housing the markings can easily be read.

### Method of Cutting Show Cards to Prevent Waste

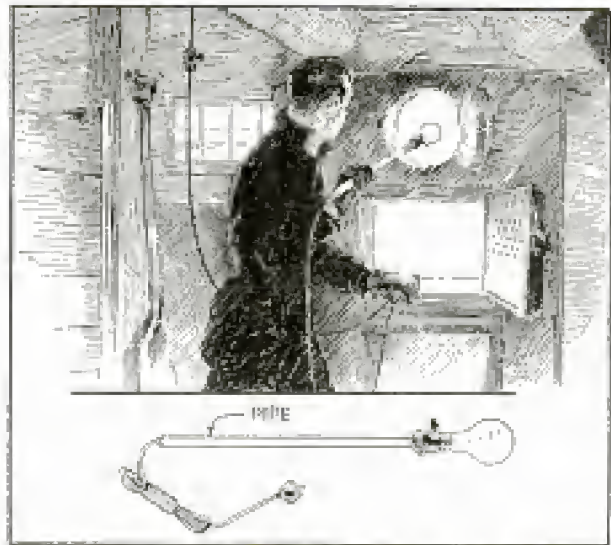


Full-size sheets of Bristol board can be cut for store signs so there will be no waste. The sheet first is cut in half and then into smaller sizes as shown. By following this method, considerable waste is avoided and cards of almost any suitable size are provided.

### Tape Prevents Fingers Adhering to Cold Door Hook

When cold door hooks are gripped with damp fingers, the skin often adheres to the metal. To avoid this, wrap a piece of adhesive tape around the shank of the hook and press it into a hard cigar-shaped mass. If the tape remains a bit sticky, rub it with ashes or sand. A piece of cloth wrapped around the hook serves the same purpose.

### Extension Light Aids in Cleaning Inside of Furnace



Electric Lamp Mounted on End of Pipe Provides Extension Light for Cleaning Furnace

Mounted on a  $2\frac{1}{2}$ -in. length of  $\frac{1}{4}$ -in. pipe, an extension lamp can be used to light the inside of a furnace while cleaning it. One end of the pipe is threaded to fit the tapped cap of a lamp socket, and a suitable length of lampcord is run through the pipe.

### Heater Element Helps to Start Motor

To start your car during cold weather, if it is kept in an unheated garage, screw a heater element in the socket of an extension cord and drop it inside of a small tin can which is placed directly under the carburetor. In 3 or 4 min. the carburetor and intake manifold will be heated sufficiently to insure vaporization of the gasoline.—Vernon Harrison, Chicago.

### Sign Inflated by Electric Fan

Mounted on an electric fan, a sign painted on a piece of cloth, sewed together at two sides to form a cylinder, will attract attention. The air blast from the fan keeps the cloth inflated. When attached to an oscillating fan, it can be seen from several angles.

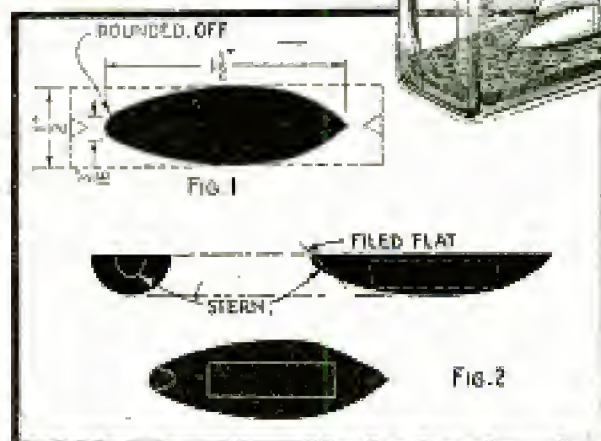
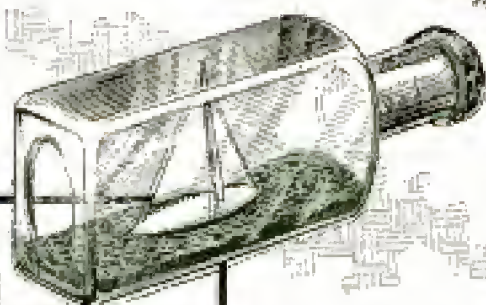
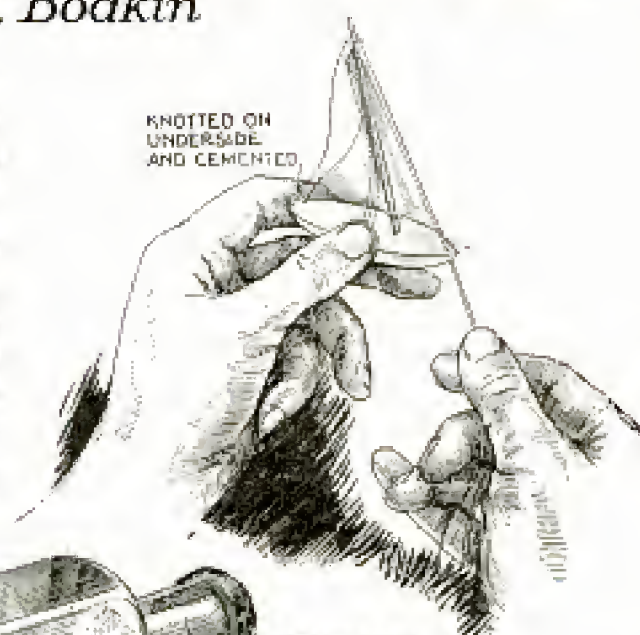




# Simplified SHIP-IN-A-BOTTLE

By H.T. Bodkin

MANY home workers hesitate at beginning a bottle-ship, but this one is greatly simplified and, with average skill, can be constructed in a few hours. Get a flat-sided bottle, about  $1\frac{3}{4}$  by 1 in. by  $3\frac{1}{4}$  in. deep, and a neck opening of not less than  $\frac{3}{4}$  in. Cut a block from white pine, about  $\frac{1}{2}$  in. square by 2 in. long, and turn it down to the shape shown in Fig. 1, or rough out the hull with a small plane and finish with sandpaper. Then, with a fine saw, cut the form in half and with a medium coarse file, flatten the larger end at an angle to form the sternboard, as in Fig. 2. On the curved bottom, mark off a rectangle and cut out the wood up to  $\frac{1}{16}$  in. from



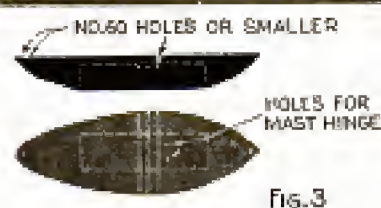
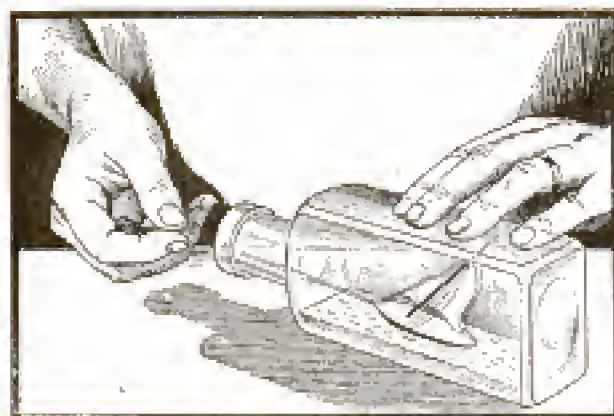
through the corresponding holes in the hull. Twist the ends of the wire together under the deck until the mast is drawn down on the deck but not too tight, allowing it to swing freely fore-and-aft. At this point, it is best to paint the ship.

Any fine brown or khaki-colored thread, say No. 60, is satisfactory for rigging. Cut a 2-ft. length, rub it with beeswax and then quickly pass it over a low flame to melt the wax into the thread. Thread a fine needle and, starting with the first of the three horizontal holes in the hull, pass the thread through as indicated in Fig. 4. Knot the loose end of the thread so that it will not pull through the hole. Hold the mast vertically while the thread is run through hole No. 3, and draw the thread taut. Drop a touch of ambroid in the holes where the loose ends of the thread emerge from the hull and, with the mast perfectly vertical both fore-and-aft and athwart, glue the threads where they pass through the mast. The back and forestays are then threaded. Tie the thread tightly with a square knot at the stern. Then, holding the mast upright, stretch the thread from the stern diagonally up through mast hole No. 1,

the deck. To receive the rigging lines and the wire hinge that holds the mast to the deck, drill eight No. 60 holes in the approximate positions indicated in Fig. 3, five vertically and three horizontally. The latter should be  $\frac{1}{2}$  in. aft of the mast and  $\frac{1}{2}$  in. apart. A fine needle, heated red-hot and quickly pressed through the hull will serve as a bit.

The mast is a round, hardwood toothpick,  $1\frac{1}{4}$  in. long, as shown in Fig 5. Cut and scrape the mast to the taper shown and drill six small holes, Nos. 3 and 6 being at right angles to the rest. The mast is fastened to the hull by passing a fine wire through hole No. 6, and bending the wire on each side of the mast to go down





pass it around the mast two or three turns and, with the thread taut, tie it with a half-hitch to the mast. The thread should be knotted so that the loose end comes squarely from the front and center of the mast. Cement the thread as before, and when dry, run it through the hole in the bow. Do not cement this forward hole. The end of the thread, after it is passed through the bow hole, should be left long so that it can be used later to pull the mast upright when the ship is inside the bottle.

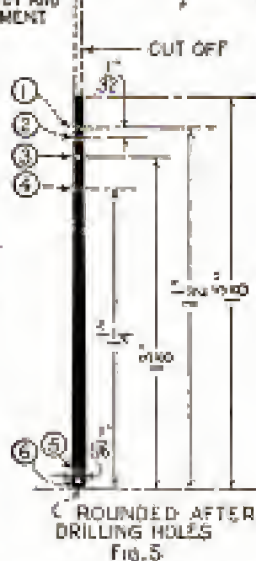
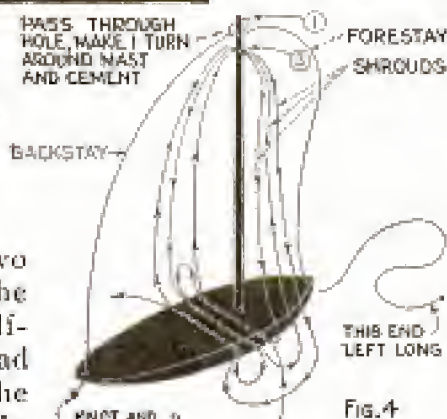
The sails are made of tough gray tissue paper. Fit them in their proper positions, trimming them along the edges until they are of the correct size. Now, cut five pieces of waxed thread 6 in. long and a sixth piece 12 to 15 in. Tie a tight single knot in the end of each piece. With a toothpick, ambroid the knots and coat the three points of each sail likewise on both sides of the paper. When the cement is dry, pierce a corner of a sail and pass the thread through, until the knot lies flat on the paper, not too close to the edge. With the knot pulled snugly against the sail, drop a touch of cement over the thread and paper, and hold the knot in place until the cement hardens. The long piece of thread goes through the forward lower point of the

foresail, and the short pieces through the remaining corners of both sails. Attach the mainsail first. Thread the needle with the "line" attached to the lower forward corner of the mainsail and pass it through hole No. 4. Leave the thread loose in the hole until the other threads are in place. Next, pass the top thread through hole No. 2. Then pass the last, or rear-corner, thread through the hole in the aft side of the deck. Now leave the mainsail and attach the threads fastened to the edge of

the foresail that goes next to the mast. One thread goes through hole No. 5, one through hole No. 4 and the long thread at the forward lower point of the foresail through the hole in the bow. Pull both sails against the mast with the threads and tie a single knot on one side of the mast with the loose ends which are then brought

around and another knot tied on the opposite side of the mast. After that the knots are cemented in place, leaving the ends long, as they can be cut off later. Now, hold the mast upright and have another person tie the third thread of the mainsail securely to the after deck. Cement this knot also. The long thread attached to the foresail is not cemented, as it serves to pull the sail taut after the ship has been placed in the bottle. Cut off all loose ends of the threads close to the knots, but

do not cut the long piece from the foresail that passes through the bow hole for the reason just mentioned. Fold the mast backward and fit the ship inside the neck of the bottle to make sure that it will pass through easily. Cover the bottom of the bottle with ordinary putty, as it lies on its narrow side, to a depth of about  $\frac{1}{4}$  in. This putty is first kneaded until it is plastic and free from lumps. Then, mix a small amount of japan automobile paint to a greenish-blue color, using turpentine to thin it. Do not thin too much, as this will make the putty "messy" when the





color is added to it. Knead a little of the paint into the putty and keep adding to it until a suitable effect is obtained. Flatten a small wooden stick to a paddle at one end to pass into the bottle without touching the side of the neck. Use this to put the putty into the bottle, a little amount at each time. Avoid touching the glass sides and neck. Spread the putty evenly over the bottom with a stiff-wire hook and then let it stand for a few hours. Now insert the ship, stern first. Use a similar wire hook to guide the ship into position and press it tightly into the putty so that the latter fills the "well" cut in the hull bottom. The two long threads at the ship's bow must extend outside the bottle neck. Allow the putty to harden for two or three days, then pull the mast upright and the slack out of the two threads with the hook, so that all the rigging is taut. Grip the two threads against the outside of the bottle, remove the hook, and cement the threads where they emerge from the hole in the ship's bow. When dry, sharpen the inside edge of the wire hook and saw off the threads close under the bow hole. Discard the waste pieces and touch the thread ends in the hole with white lacquer to match the hull.

The waves in your sea can be made with the hook. Catch it in the surface of the putty and pull it slightly toward you to make ridges in the putty. Dip the same hook in white lacquer or paint and touch the tips of the waves to imitate whitecaps. Cork and apply sealing wax as shown.

### Cloth Lining for Wash Basket



er to fit inside the basket, the whole lining being held in position by cutting holes in it to fit over the basket handles.

To keep the clothes from being soiled, a removable muslin lining for your wash basket will be found useful. The lining is made up of two pieces that are cut and sewed together



Making It Easier to Carry a Heavy Ladder by Providing a Comfortable Shoulder Pad

### Shoulder Pad for Carrying Ladder

Fitted with a soft shoulder pad at the point where it balances, a ladder can be carried with ease and comfort. This saves time in locating the point where the ladder balances. The pad is made of curled hair or folded burlap with a canvas cover tacked to it and to the ladder, or part of an auto tire casing may do.

### Heated Spark Plugs Aid in Starting Gasoline Engine

Starting cold engines or concrete mixers, etc., is sometimes a rather exasperating task, especially if the engine is not in the best of condition. Remove the spark plugs and heat them, being careful not to break the porcelain. After they have been heated, replace them as quickly as possible and crank the engine. The heat from the plugs aids in vaporizing the gas mixture in the cylinder, causing it to ignite more easily.—A. W. Dreyer, St. Louis, Missouri.

### Steel Wool Cleans Windows in Cold Weather

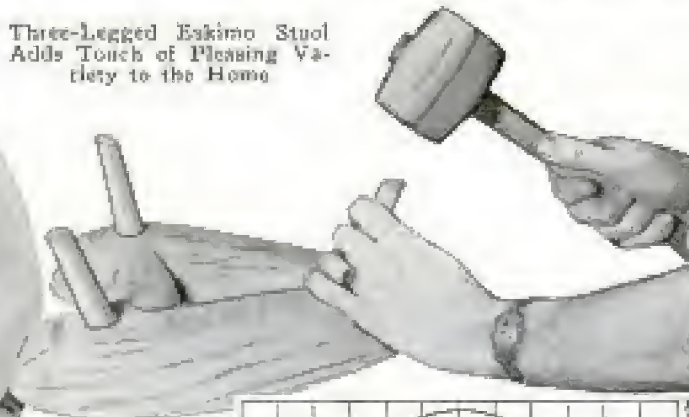
During cold weather it is often rather difficult to clean windows, because the water freezes on them. By using a good-sized wad of steel wool and rubbing it over the window, spots can be removed quickly, and the wool will not scratch the glass in any way.—B. L. Gilbert, Chicago.



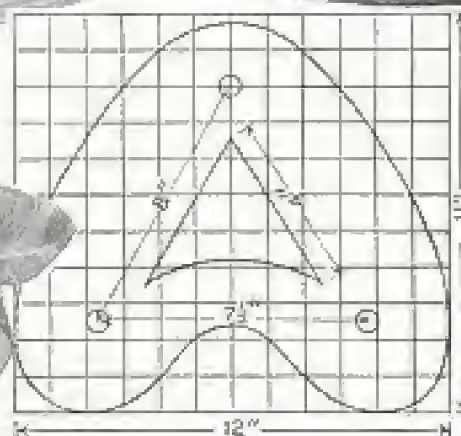
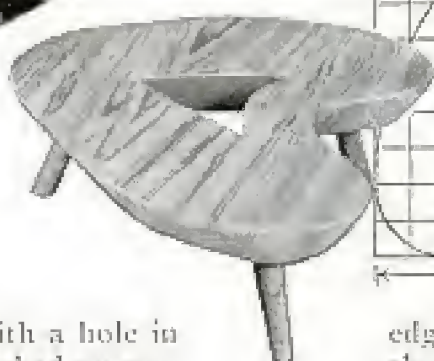
# Eskimo Stool Quickly Cut on Your Bandsaw



Three-Legged Eskimo Stool  
Adds Touch of Pleasing Variety  
to the Home



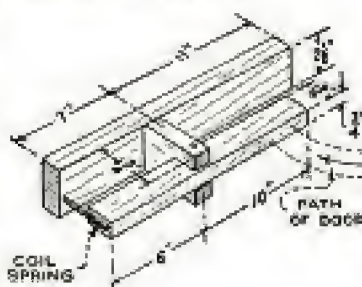
Probably you would find it inconvenient to import one of these simple, rugged but useful Eskimo stools, but you can readily make a duplicate in your shop at little cost. It is a three-legged, heart-shaped affair with a hole in the center so that it can be picked up easily. The model shown was patterned after a genuine Eskimo stool in the Cleveland Museum of Natural History, one that had enabled its original owners to fish through ice without getting frozen feet. Cut the stool top from well-seasoned wood, preferably hardwood, about 2 in. thick, using a tilting-table bandsaw if one is available, as indicated in the upper left-hand photo. Then chisel out the central opening. Also round the lower



edges with a chisel and spokeshave, but leave the upper edges fairly sharp. Dimensions for the top are given in the drawing, while the legs, shaped by turning or whittling, are each about  $4\frac{1}{2}$  in. long and tapered from 1 to  $\frac{1}{2}$  in. in diameter. They are inserted in 1-in. holes bored at an angle in the underside of the top. This angle should be such that the bottom of the legs will project slightly beyond the edges of the stool when viewed from above. The legs are beveled to fit squarely on the floor.

## Spring Check for Storm Door Prevents Broken Glass

Breaking of the glass in a storm door by slamming against the house, can be prevented with the illustrated stop. The notched block, which serves as a fulcrum, is screwed to the base. A wooden arm,



pivoted to the block, has a coil spring at one end, which checks the force of the door when it closes.

## Red-Striped Cardboard Increases Visibility of Water Gauge

Clear water in a clean gauge makes it difficult to determine the exact height at a glance. To remedy this trouble, a piece of white cardboard,  $4\frac{1}{2}$  in. wide, should be cut slightly longer than the glass, and red diagonal lines,  $\frac{1}{4}$  in. wide, and  $\frac{1}{4}$  in.



apart, painted across the entire surface. Fasten the ends of the card on the back of the gauge glass so that it is slightly curved behind the glass, and is equally divided as to its width by the glass.—Robert McNicol, Albany, N. Y.

### Getting Truck Out of Mud without Strain on Rear Springs

Should you get your truck stalled in a muddy place, chain the rear wheels up tight to the body sills before jacking up the rear part. This brings the entire rear axle closer to the load and reduces the strain on the springs. Often, when stalled, the rear wheels grind down to the hubs and by applying force enough to pull the truck out, the rear springs or bracing is likely to be wrenched. If the rear part of the chassis is jacked up and properly blocked, heavy boards can be placed in front of the rear wheels and the truck moved along to firm footing.—Evington Lemaster, Maryville, Mo.

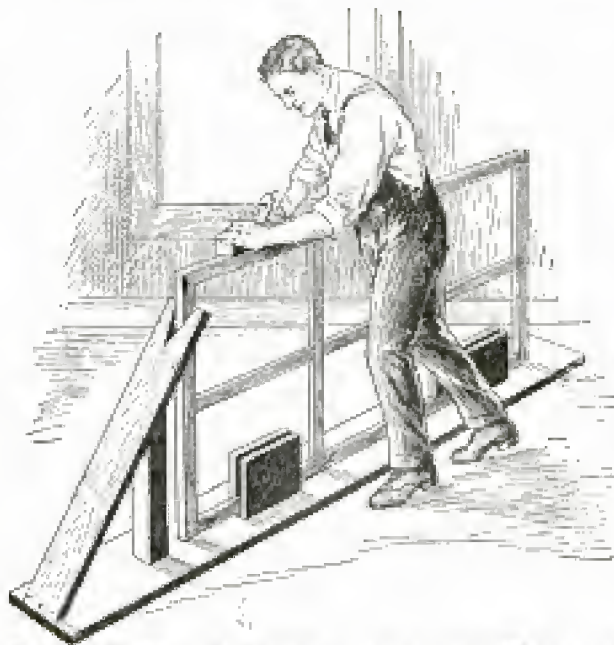
### Handles on Large Earthenware Cocks

Much effort can be saved in lifting large earthenware cocks if they are fitted with handles. To do this, rivet two door pulls to a sheet-metal band of sufficient size to just slip over the cock from the bottom. The flange around the top of the cock will prevent the band from coming off when lifting.



### Lamp Improvised from Blowtorch

For temporary use, a light of great intensity can be improvised from an ordinary blowtorch. Tie a gas mantle over the mouth of the torch nozzle, and light it in the usual way. As a blowtorch has considerable more pressure behind it than a gas lamp, care should be taken not to turn it on too far as this might burst the mantle.—Dr. F. J. Svoboda, Cozad, Nebr.



Special Holder of Simple Construction Eliminates Awkwardness When Planing Window Frames

### Wooden Holder Simplifies Planing of Window Frames

This holder is made of 1-in. stock and consists of a base to which two cleats are nailed for holding the bottom of the window frame. The end of the frame is held by a notched piece nailed to the front of the base at an angle and supported by a brace.—J. T. Watkins, Astoria, N. Y.

### Fence Posts from Old Auto Frames

Imbedded in concrete, the side members of old auto frames make sturdy posts for fences around industrial plants, schools, etc. The ends of the frames, which are usually bent to accommodate the front spring, provide the desired overhang and should be placed with the bend toward the outside of the fence, to be more effective in keeping out trespassers.—R. F. Starzl, Le Mars, Iowa.



☐ Before letting the baby use new shoes, sandpaper the soles and it will be saved many falls.



### Window-Seat Wood Box Operated by Windlass



By utilizing a window seat in a living room for a wood box, fuel can be hoisted from the basement with a dumb-waiter. First make a box from 1-in. material, with the ends extending a few inches above the sides. Then cut a hole in the floor underneath the window seat large enough for the box to go through. Also cut a similar hole

in the top of the seat, fitting it with a hinged lid. Bolt a length of 2 by 4-in. stock to the basement floor, directly under and about the center of the hole in the floor, and drill two holes in it for two lengths of iron pipe to serve as rails on which the box slides up and down. Insert a length of pipe through the holes drilled in the ends of the box near the top, and fit a pipe tee, large enough to slide over the pipes, on each end. Drive a screweye into each end of the box near the bottom, also to slide on the pipe, to prevent the box from swinging. Then set one end of the pipes in the holes in the 2 by 4-in. piece and fasten the other ends to the underside of the seat with a length of 2 by 4-in. stock in a similar manner. Next fasten two pulleys underneath the top of the seat and run a rope over them, one end being tied to the pipe inside the box and the other to a windlass fastened to the basement wall. In use, the box is filled with wood in the basement and hoisted up in the window seat where it is concealed, being held by hooking a small rope, fastened to the basement wall, over

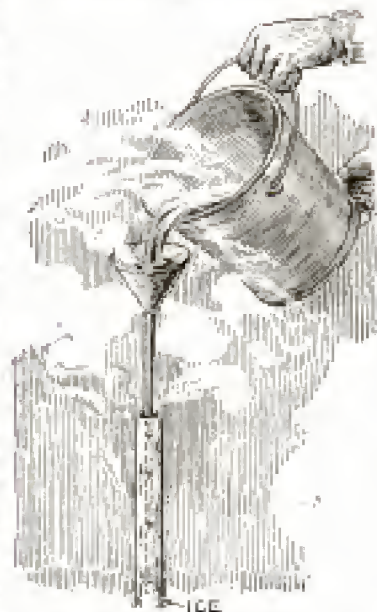
the windlass handle, as is also shown in the drawing.—R. B. Black, Los Angeles, California.

### Temperature Indicated by Paint

For certain kinds of heat treatment for steel, a reliable temperature paint that gives a visible warning by changing color can be made as follows: Dissolve gum arabic, 10 gr., to each ounce of water, then add mercury iodide, 1 part, and silver iodide, 1 part. At ordinary temperatures this is a yellow compound, but when heated it gradually turns to a brilliant red. The last stage occurs at about 115°. If copper iodide is substituted for the silver iodide, the paint will blacken at about 190°, but will again turn to its normal color when cooled. A practical use for the paint is covering for heating containers. With an accurate thermometer and ordinary paints of graduated colors, a chart can be made that gives the temperature of the container when it reaches different shades of color.

### Thawing Out Water Pipes

Thawing out an overflow pipe of the watering trough was simplified by an Indiana farmer with the aid of a funnel and a length of smaller pipe. The frozen pipe was of 1-in. size, so that a piece of ¼-in. pipe could be shoved down to the ice. A funnel was slipped into the upper end of this pipe to receive the hot water. By this method the hot water runs down on the ice while the cooled water rises between the pipes.



❑Dust and lint can be removed from the mechanism of a typewriter with a tire pump.

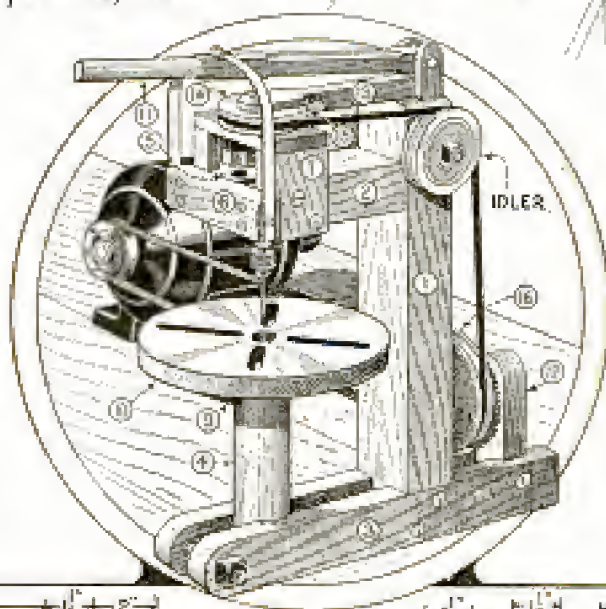




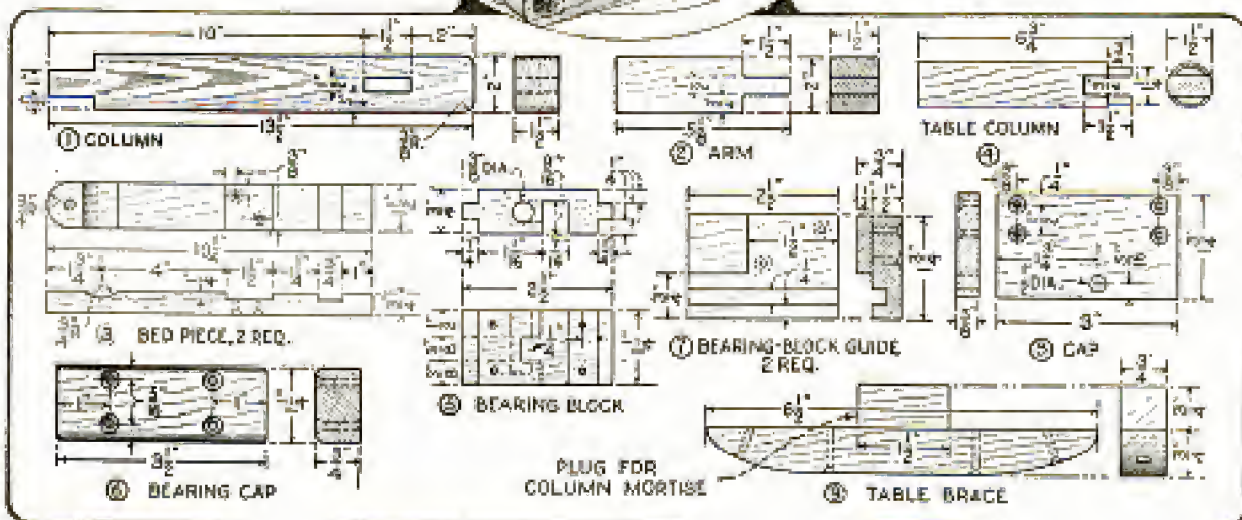
# Sensitive DRILLPRESS for Small Work

By Edwin M. Love

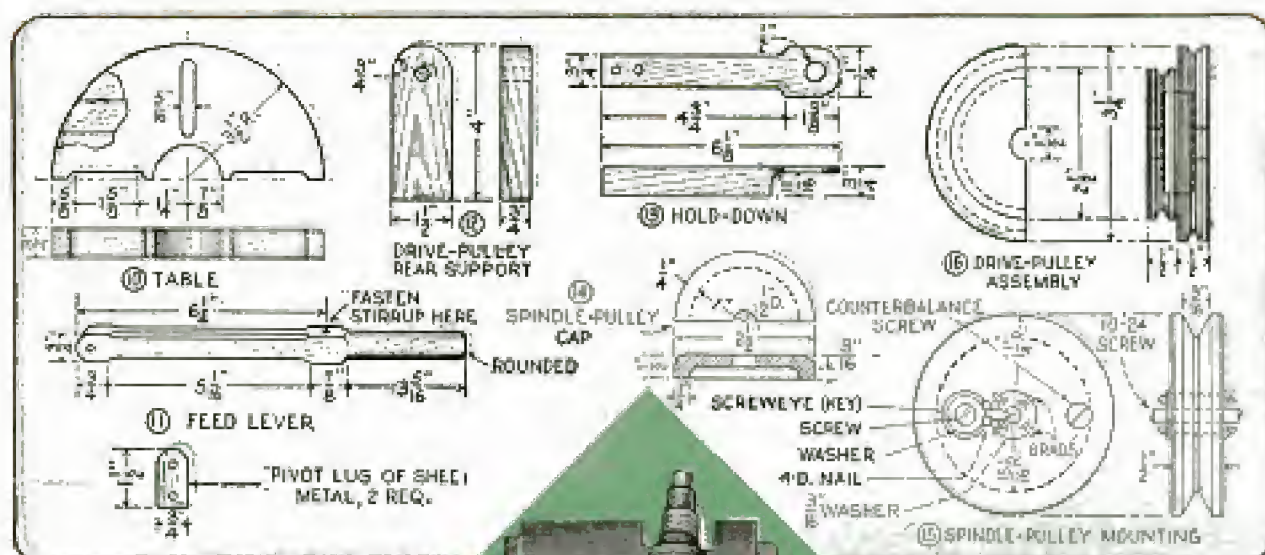
ASSEMBLED from a pin vise, roller-skate wheels and scraps of hardwood, this sensitive drillpress is a handy addition to the small shop and is especially useful in model making. The heart of the press is a pin vise, which forms the chuck for holding small drills or fine needles. In its usual form, the body is hollow and knurled the greater part of its length before expanding for the chuck, and as a bearing surface is required here, it is necessary to turn off the knurling. Chuck it in a lathe and stroke it with



a flat file as it turns at high speed, finishing with fine emery cloth and oil. The bearing block is tongued on the ends to slide between grooved guides, and has a crosswise groove for the bearing. Drill a  $\frac{3}{8}$ -in. hole beside it, connect-







ed to it with a chiseled channel, so that a piece of waste can be tamped in for an oil wick. Now expand a  $\frac{1}{4}$ -in. machine washer to slip over the top of the vise. This is done by driving a punch into the hole, afterward hammering the washer flat again. This forms the lift-thrust washer. Expand three thin washers for the pressure thrust, two of them fitting freely and the third binding on the upper knurling. Flatten the expanded washer after being put in place, and it will hold. Next cast the bearing. Hammer flat a length of wire solder. Wrap it around the vise bearing and lay the vise in the block, wedging it at such depth that it will center in the thickness of the block. Hold it with twine. Flow solder around it with a hot copper, pry out, block in place with the solder at the bottom, and complete the bearing. Be sure, however, to twist the bearing loose after each half is cast. Melt out a section to connect with the oil hole.

The frame of the press is of hardwood, the arm being mortised into the column and the latter into the base strips. Glue these parts, but leave the drive-pulley-assembly rear bearing unglued, so as to permit removal. The two guide blocks are notched for mounting on the arm, and grooved for ways to fit the bearing-block tenons. Thicknesses of paper under these guides will provide for necessary clearance. Place the screw holes in

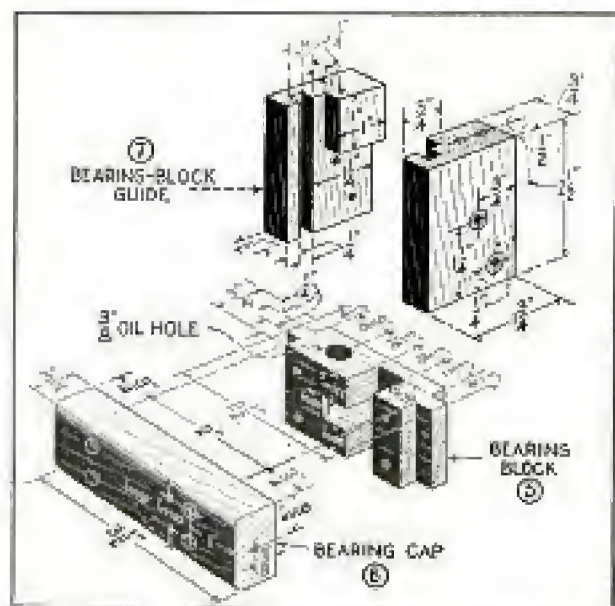
the bearing cap to center on the solid sections of the bearing block, and bore the latter so that the screws will not split it. Brace the guide tops with a  $\frac{3}{8}$ -in. cap screwed in the thick parts, and pierced with a  $\frac{1}{2}$ -in. hole

to admit the spindle. As the spindle, being driven by its pulley, must be free to slide up and down while the pulley remains at a constant level, a sliding key is needed, and a long keyway to mate with it. This is done by extending the pin vise with a machine screw, about  $\frac{3}{16}$  in. in diameter, driven in the hollow end. A No. 10 screw,  $2\frac{1}{2}$  in. long, is about right. As the threads are rolled, they are larger than the smooth part of the screw, and the thread diameter varies a little. It is possible, by trying a number of screws, to find one that can be securely twisted into the vise by means of pliers. Holding the screw in a vise, cut a  $\frac{1}{16}$ -in. deep slot lengthwise with a hacksaw, for a keyway. From  $\frac{1}{2}$ -in. hardwood, preferably five-ply, turn four pulleys,  $2\frac{1}{2}$  in. in diameter. A three-cornered file, ground to a point at the tip, is excellent for shaping the grooves. For the idlers, bore holes just large enough to admit roller-skate wheels which are forced in by tapping lightly. Also turn a pulley,  $3\frac{1}{4}$  in. in diameter, recessing this and one of the smaller wheels to receive a roller-skate wheel, the two, when assembled, inclosing the wheel. Notice that the centers must be bored large enough to clear the stationary part of

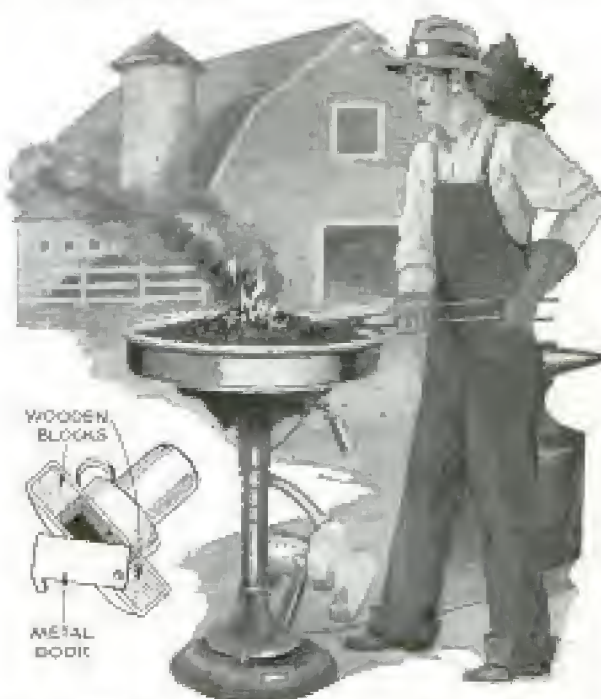


the wheel center. Screw the assembly together and mount with a  $\frac{1}{4}$ -in. lagscrew through the center, and some washers at each end. The spindle pulley is drilled  $\frac{3}{16}$  in. at the center. Attach above and below it washers, held with four bent-over brads. Remove the keyway screw from the spindle, slip it through the pulley, and again screw it into the spindle. Cut the threaded end from a  $\frac{3}{4}$ -in. screw-eye, and file on the stub a tenon to fit the keyway. Screw the eye flat on the upper side of the pulley, the key meshing with the groove, and drive a short piece of four-penny nail each side of the stub, to prevent swiveling of the eye. In boring the hole for the idlers, align the groove where the belt will run with the driven and driving pulleys. The idler at the left is parallel to the arm, while the right one inclines toward the driven pulley. Therefore, incline the bolt hole backward  $\frac{1}{8}$  in. when entering from the left, so that, when the end carrying the right idler is bent forward, the groove will not be drawn out of line with the large pulley. Glue split wooden washers of proper thickness between the column and the idlers.

Turn a cap for the spindle pulley, relieving it on the underside to fit over the washer and screws of the pulley, and brad in place. Mount the hold-down on the top of the column, centering the hole on that in the pulley cap, screw on the lugs, and pivot the feed handle.



Isometric Drawing Showing Relative Positions of the  
Bearing Block, Cap and Guides



Improved Electric-Driven Forge for the Farm or Workshop Is Made from Scrap Parts

### Vacuum Cleaner Provides Blower for Workshop Forge

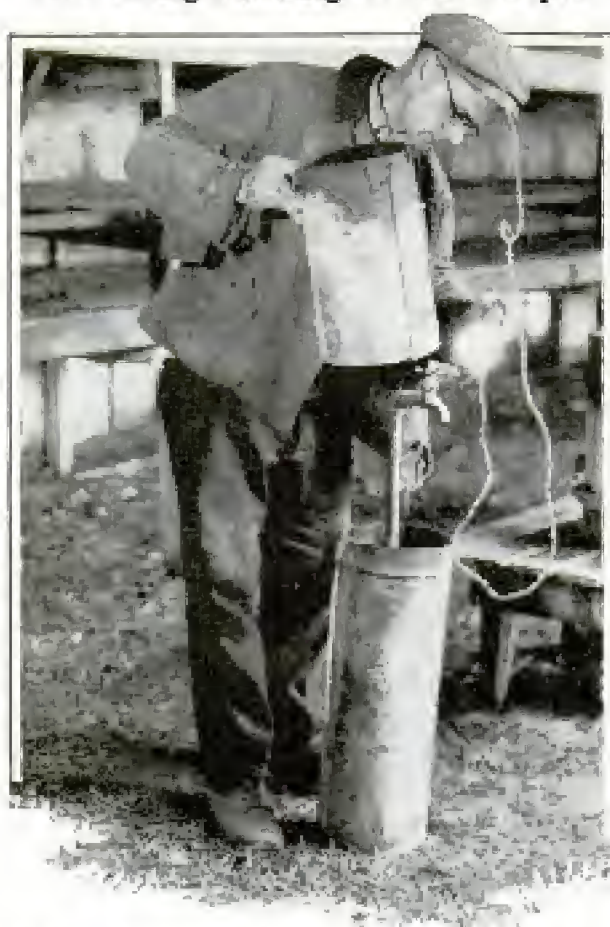
Anyone, who has a discarded vacuum cleaner, can make this forge. A support is made from one-half of an auto axle housing mounted on a harrow disk. The blower consists of a motor and fan taken from the vacuum cleaner and is attached to the base of the forge by means of a tube inserted into holes cut in the support and the fan housing of the sweeper, as shown. Draft control is provided by blocking the ends of the suction nozzle and fitting a metal door over the hole between the blocks. The fire bowl is a sheet-metal disk fastened to the top of the support and is perforated with a number of small holes. A tire rim is fastened to the disk to prevent the fire from falling out. The entire fire bowl is lined with clay.

## Starting a Tractor in Cold Weather

Hard starting of a tractor during cold weather can be overcome by cranking it with a car. Attach a pulley to the rear wheel of the car and run a belt over it to the belt pulley on the tractor. Release the control on the tractor so that the pulley will turn freely. Then speed up the car and engage the pulley control on the tractor. This will enable the car to turn the tractor motor until it starts.



### Preventing Freezing of Water Pipes



Water Pipes inside Poultry House Prevented from Freezing by Stovepipe and Electric Lamp

A poultryman near Lafayette, Ind., uses a simple method to prevent the water pipes in his poultry house from freezing. Lengths of old stovepipe are set over the water lead and a 25-watt electric lamp is hung inside of them. The heat from the lighted lamp suffices to prevent freezing in the coldest weather and running water will be available at all times.

### Corrosion Causes Ignition Trouble

Hard starting of an auto motor is frequently due to slightly loosened electrical connections which have become corroded, although the motor may run well after it is started. When the ignition switch is turned on, the current must break down this corrosion and create a path for itself. Until the current is able to do this, and build up to its full strength, poor ignition, or no spark at all, may be found. The current flow may be noted by observing the pointer of the ammeter while the engine is being cranked. It should swing over to between

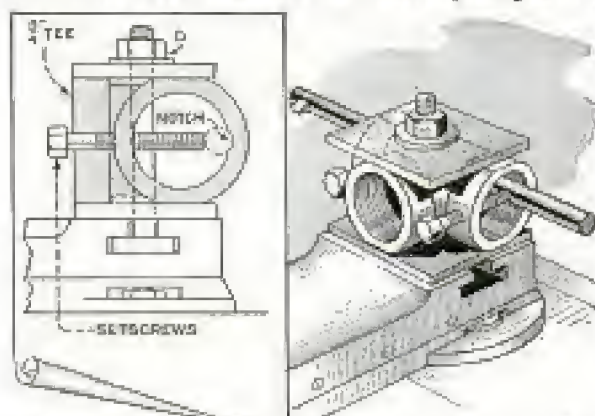
4 and 6 amp. at regular intervals. If it does not do this regularly, a corroded terminal somewhere in the ignition circuit may be suspected, perhaps at the timer points. If cleaning the points does not remedy the trouble, all the ignition wires should be shaken in turn, while observing the ammeter. Any irregular movement of the ammeter should be checked by inspecting the terminal of the wire which seems to cause the irregularity. After the terminal has been cleaned and tightened, recheck the wires in order to be sure the fault has been corrected.

### Cure for Saw-Filing Squeaks

Shrill squeaks when filing saws, can be reduced by the use of sheet lead. Cut two strips the length of the saw clamp and about 1 in. wider than the face of the clamp. Place them in the clamp, one at a time, and bend over the projecting strip so that they will hang in the clamp. Then place the saw between them and tighten the clamp. These silencers absorb the vibration which causes the squeaks.—W. W. Wheatly, Fresno, Calif.

### Lathe Boring Tool Improvised from Pipe Tee

In the absence of a boring tool, a good substitute can quickly be made from a pipe tee. Two holes are drilled and tapped for setscrews which hold the tool in a notch filed in the inside of the tee. It is faced flat on top and bottom and drilled in the center for a bolt to hold the tee, the head of the bolt being ground square to fit in the toolpost slot. A piece of flat metal, of the proper thickness to aline the tool with the headstock center, is placed



This Boring-Tool Holder Is Assembled from a Pipe Tee, Bolt and Two Flat Iron Plates

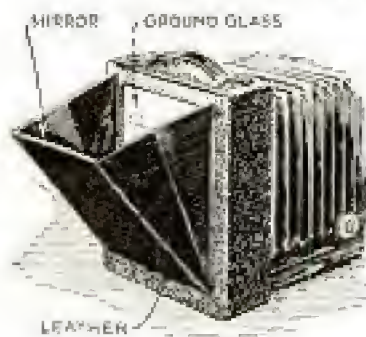


between the tee and the lathe compound rest, while a similar piece is placed on top to provide a smooth surface for adjusting the tee, both pieces being drilled to receive the bolt as indicated.

### Beach-Sand Molds for Metal

Beach sand thoroughly mixed with flour and water, makes good molds for casting metal. Just enough water should be added to moisten the ingredients. After packing the sand around the pattern, it is baked in an oven until thoroughly dry and hard. A mixture of oil and graphite on the pattern, and dry graphite between the halves of the mold, will insure separation and the easy removal of the pattern. Vent holes should be made in the mold. The flour is burned out of the sand which is in contact with the metal.

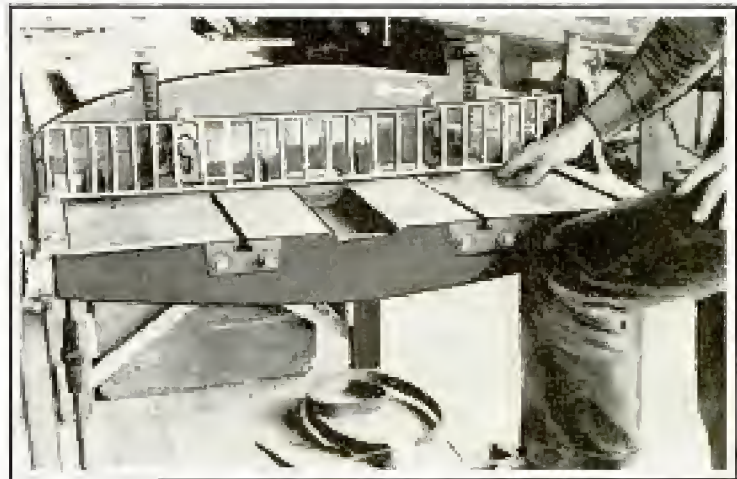
### Mirror Adds Reflecting Feature to Ordinary View Camera



Inexpensive and easily constructed, the illustrated mirror arrangement will add the reflecting feature to a regular view camera. Cut a piece of thin

mirror to the size of the camera ground glass and cement it to the back of a piece of imitation leather, cutting the latter large enough so that the excess leather at the sides will form a folding pocket when attached as shown. A space of  $\frac{1}{2}$  in. should be allowed at the bottom to serve as a hinge. Used in this manner, the mirror unfolds quickly, the leather at the sides keeping out excess light. The mirror shows the reflected image full size and right side up.

¶ To find the diameter of a circle, multiply the circumference by .3183 instead of dividing it by 3.1416, multiplication being easier than division to most people.



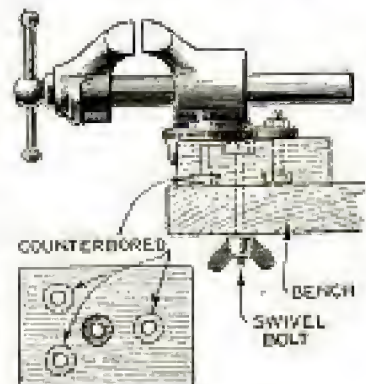
Injury to Operator's Hands with Square Shear Prevented by Guard Bolted to Work Hold-Down

### Guard Prevents Cutting Fingers on Shear

Bolted to the holder for the work, this guard for a square shear will protect the operator against injuring his fingers on the cutting blade. It consists of two lengths of  $\frac{3}{16}$ -in. iron rod, having 6-in. pieces of the same material welded cross-wise between them at 2-in. intervals. Two short rods are bent into loops and tightened under the nuts on the bolts of the hold-down. This keeps the guard about 3 in. from the cutting edge of the blade and allows it to touch the table when the cut is being made.

### Swivel Joint Increases Usefulness of Stationary Vise

Fitted with a swivel, the usefulness of a stationary vise can be increased greatly. The vise is bolted to a hardwood block, countersinking the bolt heads flush with the underside of the block so they will clear the bench when the vise is turned. The block is then pivoted to the bench top with



a bolt and wingnut, the head being similarly countersunk to clear the bottom of the vise. This arrangement will allow the vise to be turned and used at any angle.



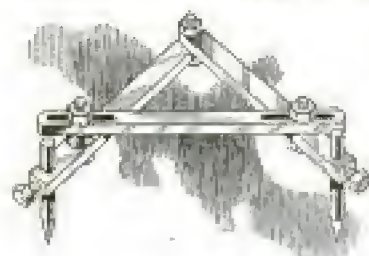
### Old Ice Tanks Used for Scaffolding



Scaffolding Supported by Discarded Ice Tanks Is Quickly Torn Down without Damage to Material

A building contractor in Topeka, Kans., uses old ice tanks in the erection of scaffolding for building construction. Their advantages over wooden supports are quicker erection with less labor, more strength and rigidity, elimination of cross bracing and platform lumber, as well as easier storage and transportation. In addition, they enable openings to be made quickly by leaving out or withdrawing connection lumber as shown. They are also adaptable for either interior or exterior work in any unit length desired and have been used successfully up to three-story heights.

### Center Punching at Equal Intervals



When you have work that requires a number of perforated holes, here is a spacing punch that will speed up the work. The tool consists of two lengths of bar iron pivoted together at one end while holes are drilled in the oth-

er ends to hold center punches which are kept in position by setscrews as indicated. Another length of bar iron is slotted at both ends and fitted over bolts in holes drilled a few inches back of the punches, to serve as an adjustable spacer, a washer of suitable thickness being used between this bar and the lower arms to keep them in alinement.

er ends to hold center punches which are kept in position by setscrews as indicated. Another length of bar iron is slotted at both ends and fitted over bolts in holes drilled a few inches back of the punches, to serve as an adjustable spacer, a washer of suitable thickness being used between this bar and the lower arms to keep them in alinement.

### Preventing Cracks When Flanging Metal

Before attempting to flange a piece of sheared sheet metal, it is a good idea to remove the burr from the edges. This can readily be done by using a file, or in cases of poor shearing, a cold chisel. Absence of the burr prevents the metal from slipping off the line in the vise or flanging machine. It also prevents cracking at the edges, if the burr side of the metal is to form the outer corner or heel of the finished flange. Some metals crack even though the ragged edges have been removed. To overcome this, slightly chamfer the heel side of the metal with a round file before bending.

### Neat Sign Fasteners from Gummed Paper and Pins

By bending a pin as shown in the detail and using a three-cornered piece of gummed paper, a neat hanger for window signs can be made. Hold the pin against the window and paste the paper over it. Then hang the sign on the bent pin.



### Tooling for Duralumin

In turning duralumin, set the cutting edge of box and similar tools a little above the center, instead of at the center, as with brass. Also give about 5° front clearance for best results. Forming tools that pass under or down beside the work, which makes them act as scraping tools, work better with a little shearing action to the cut. A 10° shear and a similar front clearance give a good clean job.



Abrasive belts - Minnesota  
Mining & Mfg. Co.  
799 Floral St.  
St. Paul  
Minn.

# Using ABRASIVES in the Small Shop

By W. Clyde Lammey

GRINDING and polishing in the home shop need not be limited to the use of emery and buffing wheels in the ordinary manner, for readily available materials offer possibilities of making many additional appliances of value in this branch of work.

For grinding a true face on small flat work, the lap board shown in Fig. 1 is useful. The surface of the base must be true and of sufficient width to allow two strips of emery cloth, one very fine and one of medium grit, to be clamped tightly over the base as shown.

Another useful accessory on a buffing spindle is the emery-covered grinding wheel shown in Fig. 2, consisting of a turned and slotted hub. Strips of emery cloth are cut to the width of the hub and about  $3\frac{1}{2}$  in. in length, and are inserted in the four slots. The strips are held in place at one end by small screws, one in each slot, with the

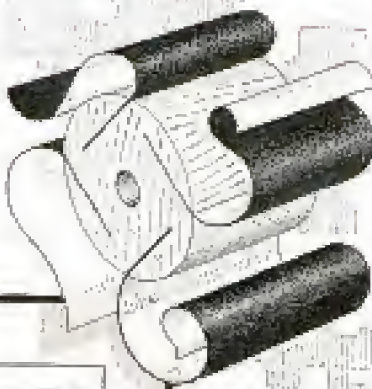
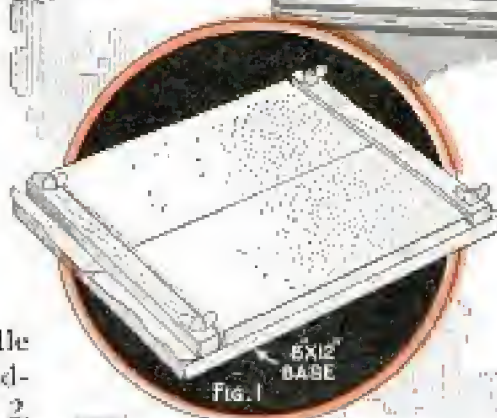
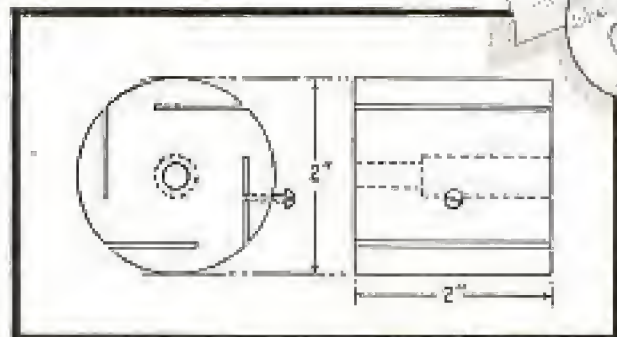


Fig. 2

head sunk in a counterbored hole. The hub must be counterbored so that it turns up on the tapered buffing spindle and the slots may be accurately cut on a bandsaw. In use, the flying strips strike and cut on all parts of the surface, being especially effective on irregular work. The speed of the buffing spindle should not exceed 1,800 r.p.m.

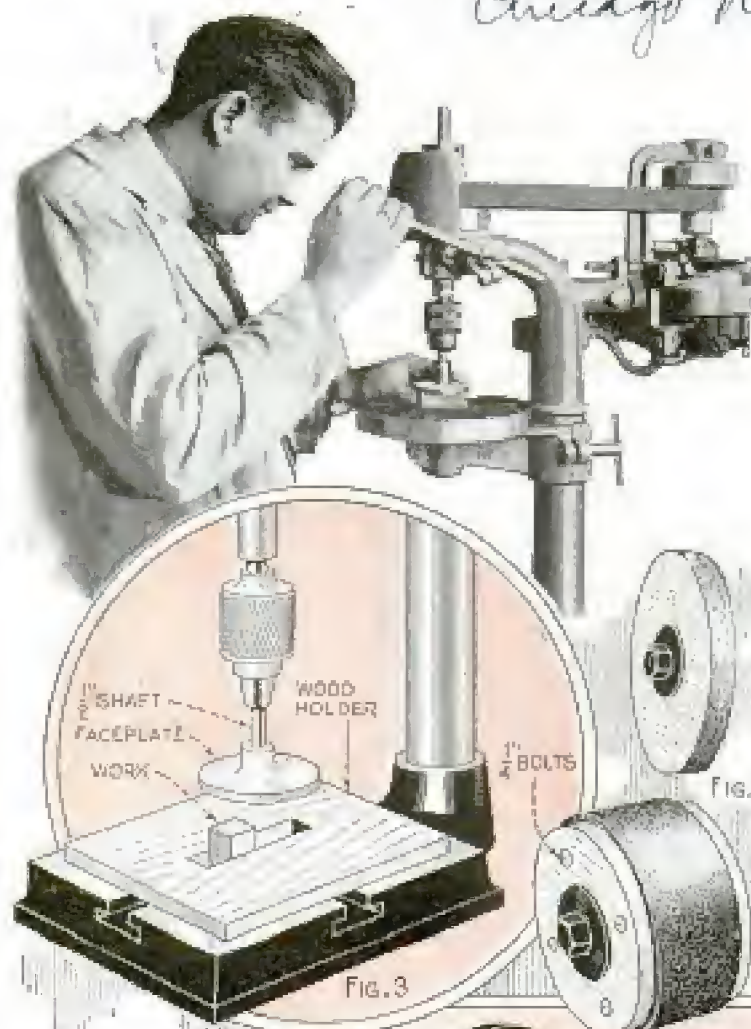
Two additional types of flexible abrasive wheels that are mounted on a spindle are shown in Fig. 4, the first being simply a disk of emery cloth backed by a disk of  $\frac{1}{2}$ -in. felt of equal diameter. The cloth is not glued to the felt, as the latter acts merely as a backing

to prevent tearing and to better hold the abrasive up to the work. The second wheel is made up of two disks, cut from  $\frac{1}{2}$ -in. felt and held between two wooden disks, the diameter of each being 1 in. less



Quincy. 1500 & Western Ave.





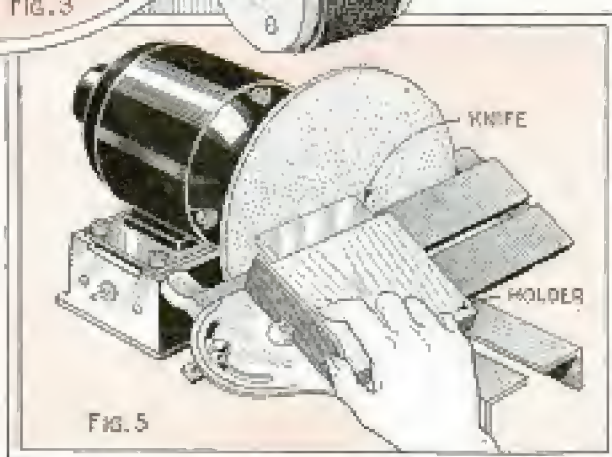
than that of the felt. The parts are held together with  $\frac{1}{4}$ -in. bolts. The felt surface of the wheel is impregnated with polishing rouge. Care should be taken to cut the disks true and to center the spindle hole, as otherwise they will vibrate when running at high speeds.

Another method of grinding a true, flat surface on small parts is shown in Fig. 3, using a lathe faceplate for the grinding disk, a 2-in. length of steel shafting,  $\frac{1}{2}$  in. in diameter, being inserted in the faceplate and tightened in the drill chuck. The faceplate is coated with a special adhesive such as is used for attaching garnet paper to sanding disks, to hold an emery-cloth disk. The work is held in a slotted block of hardwood, and only the

portion between the center and the rim of the faceplate is allowed to do the grinding to get a true surface. Fig. 5 shows a practical method of grinding planer knives, use being made of a sanding disk to which is glued a disk of fine emery cloth. The work is held in a slotted wooden holder in the position shown on the sanding table, guided by the miter gauge. Only half the disk is used in grinding, and the work should not be allowed to pass the center of the disk.

Two grinding appliances for sharpening gouges with either inside or outside bevels, are shown in Fig. 6, the first being simply a hardwood cone turned to approximately the dimensions given. The conical surface is coated uniformly with thin glue, and after this has set slightly, the surface is sprinkled with medium emery powder. When the surface is dry, the process is repeated, three applications giving the

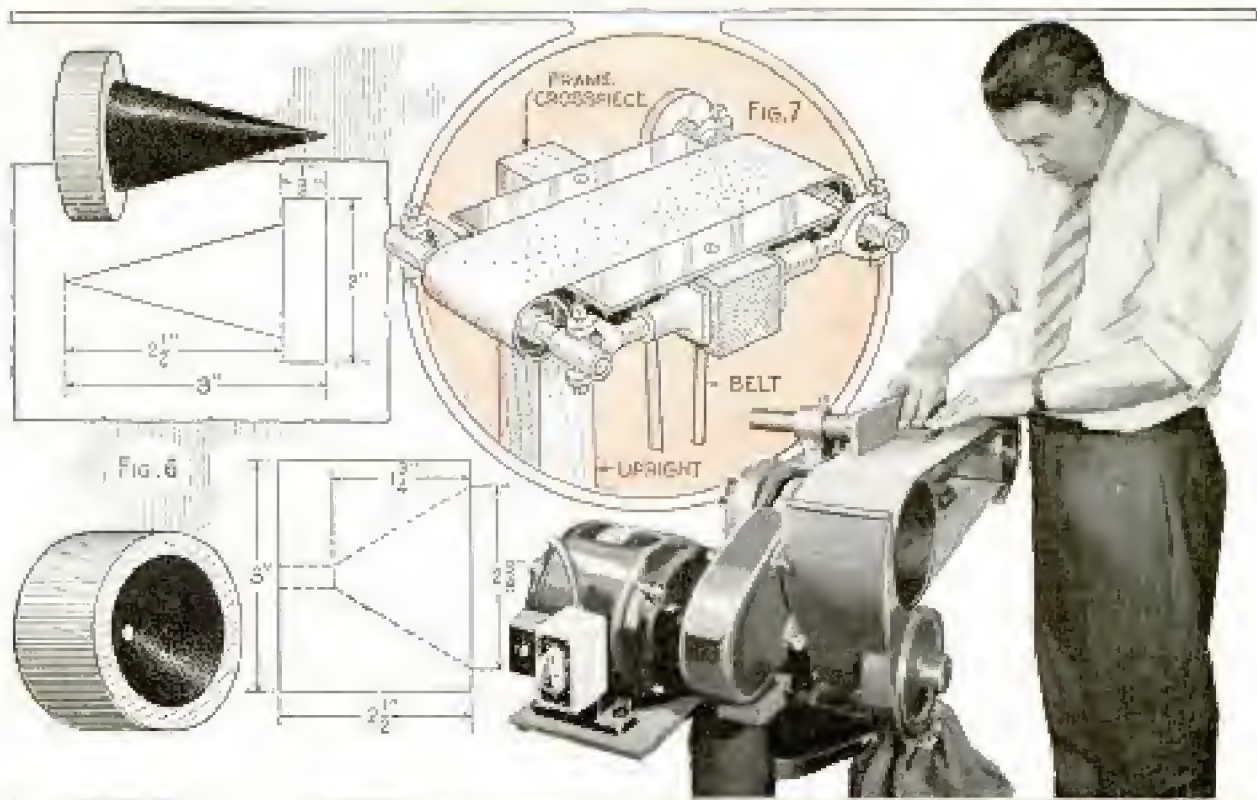
best grinding surface. In use, the inside beveled gouge is inverted, and the edge placed on the revolving cone in such a position that the curve of the edge coincides with that of the cone. To make the second grinder, turn a disk from hardwood to



the approximate size indicated. Then turn out a conical recess. Coat this with thin glue and sprinkle with medium emery powder three times, allowing the glue to dry between applications. To use, place the outside beveled gouge, concave side up, so that the edge coincides with the curve of the abrasive surface.

When using a grinder, it is always best to wear goggles to protect the eyes, and no valuable machine or tool should be near the grinder, as particles of grit may get into the bearings. A power-driven





lap grinder of the type shown in Fig. 7 is especially useful to the model maker, as it effectively supplants the use of a file in truing small parts. The assembly of the grinder consists of four small shaft hangers, bolted to a crosspiece of hardwood in the manner shown, the size of the crosspiece depending on that of the hanger bases. The hangers may be of a size fitting  $\frac{3}{8}$ ,  $\frac{1}{2}$  or  $\frac{3}{4}$ -in. shafting, according to the capacity and size of the machine desired. The pulleys may be made of wood turned to about 3 in. in diameter, depending on the width of the hanger base. The face of the pulley should be  $\frac{1}{2}$  in. wider than the width of the abrasive belt. The pulleys are keyed centrally on the shaft, which is held in place in the bearings by collars. The table may be made from  $\frac{3}{8}$ -in. steel plate, the plate being screwed to the crosspiece with the ends projecting the same distance. The machine may be mounted on the bench or, if desired, may be made into a self-contained motor-driven unit by bolting the crosspiece to a single square column, the lower end of the latter supported on a square base to prevent tipping. The motor may be bolted on a shelf, attached to the column about 6 in. above the base, the motor pulley aligning with the pulley on the grinder shaft. Abrasive belts of

varying widths and lengths as well as grit sizes for metal or wood can be obtained already spliced. The belt may be tightened to the proper tension and aligned on the pulleys by adjustment of the hangers, and may be easily removed and replaced by another belt of finer or coarser grit by simply slacking the hanger-column set-screws. If necessary, a wide channel may be cut across the lower face of the crosspiece to allow belt clearance. Drill and tap the bearings for grease cups and use a rubber V-belt on V-pulleys for the drive.

### How to Grind Drills to Prevent Burrs



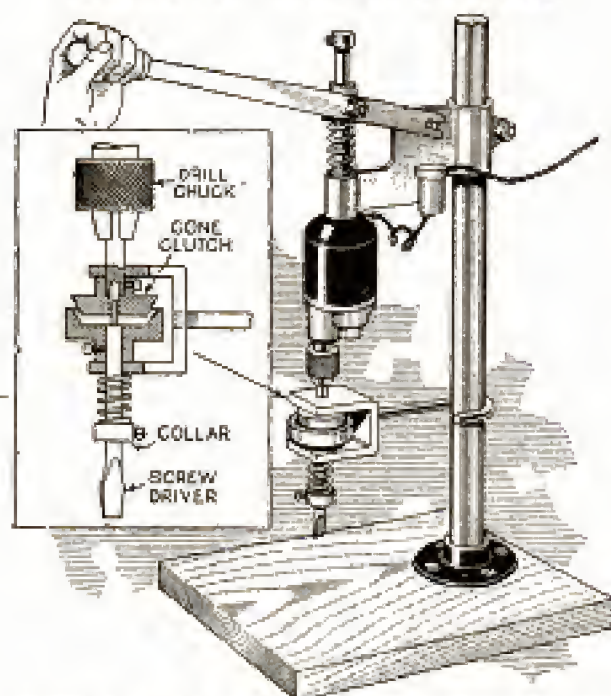
idea to use bushings to guide the drill when starting it.

Drills ground as shown in the illustration will not cause burrs on the underside of the work when the drill breaks through. The angle at which the drills are to be ground depends on the quality of the material to be drilled. It is a good

❏Sponging with gasoline or some similar fluid will clean soiled tracings.



### Screwdriver Driven by Drillpress



Screws Are Quickly Driven with This Cone-Clutch Assembly Attached to a Drillpress

Driven by means of a cone-clutch assembly attached to almost any type of drillpress, this tool will speed up work where a great number of screws are to be driven. No dimensions are given, as these depend on the type of press used. A U-shaped piece of steel is drilled and tapped at the bottom for an iron rod, bent into a hook at one end to fit around the metal support of the press, to prevent the assembly from turning. Holes are drilled in line with each other through the sides of the U-shaped piece. A steel shaft is passed through the upper hole and chucked in the press and the lower end is fitted in the top member of the clutch. The screwdriver blade is inserted through the lower hole, and the collar part of the clutch fastened to it as shown in the detail. The lower part of the clutch is held against the U-shaped piece by means of a compression spring slipped over the screwdriver blade and kept in place with an adjustable collar, which allows the tension on the screwdriver to be varied. When the screw is driven home, the clutch will slip.

### Refinishing Peroxide Spots on Furniture

Hydrogen-peroxide spots on furniture can be removed as follows: First apply oil stain on the spots to match the surface.

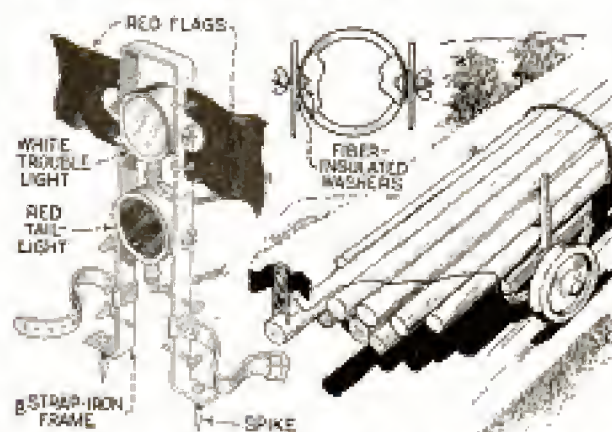
Then use a small camel's-hair brush to varnish the spots, building them up slightly higher than the surrounding surface by applying successive coats at 24-hour intervals. Then rub down level with finish first with powdered pumicestone and water and next with powdered rottenstone and oil on a felt-covered wood block.

### Treatment for Frozen Combs on Poultry

As a remedy for frozen combs on fowl, first thaw out the affected parts by rubbing vaseline into them with the fingers. Keep the birds in a cool place away from heat, and continue rubbing the combs twice a day with the following mixture: vaseline, five tablespoonfuls, glycerine, two and turpentine, one tablespoonful.

### Portable Tail Light and Flag for Overhanging Loads

Truck drivers will find the illustrated tail light and warning flags handy to attach to long overhanging loads. It consists of a U-shaped piece of  $\frac{1}{8}$ -in. flat iron of suitable size, on which the lights and flags are mounted as shown. If desired, the flags may be cut from light sheet metal and clamped to the frame with wire. The lower end of the frame is fitted with thumbscrews and leather straps for fastening the assembly to the rear of the load, while the ends of the frame are bent at right angles and drilled for nails, if used on loads of logs, etc. A length of extension cord is run from either lamp to the regular tail light of the truck, where it is attached to the lamp socket by means of a plug.



This Extension Tail Light and Red Flag Is Attached to Any Kind of a Load Projecting beyond Rear

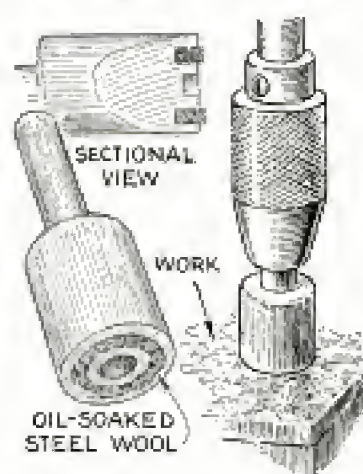


### Keeping Water Drip from Valve-Rod Packing Nut Out of Crankcase

Water drips from the valve-rod packing nut on small vertical steam engines, can be kept out of the crankcase by using a large-size steel grease-cup cap. Drill a hole in the center of its top to fit over the valve rod, and braze a length of copper tubing in a  $\frac{1}{4}$ -in. hole drilled in the side of the cap near the top edge, to serve as a drain pipe for the drippings which are caught in the cap. It is then an easy matter to place this assembly over the valve rod, open end up, between the packing nut and slide bar.—R. C. Norton, Hamilton, Ont., Can.

### This Tool Puts a Decorative Finish on Aluminum

The finish on aluminum can be restored after machine operations, such as drilling and milling, by using a length of hardwood in a drillpress. A shank is turned on one end of a broomstick to fit the chuck, while the other end is faced off



and recessed,  $\frac{1}{8}$  in. wide and  $\frac{1}{4}$  in. deep, as shown. The recess is packed with fine steel wool, which is allowed to project a little. In use, the aluminum is coated with a film of oil and the tool rotated on the surface. Bring

it in contact with the work for a moment, then raise it, and repeat the operation in a manner similar to drilling a number of holes. The fineness of the finish depends upon the number of times this process is repeated.—W. B. Decker, Delaware, O.

### How to Improve Cheap Printing Ink

Cheap grades of printing ink can be improved so they will give better results in the following way: Put two or three drops of water glass on the ink disk of the press, which will soon be spread uniformly by the rollers.



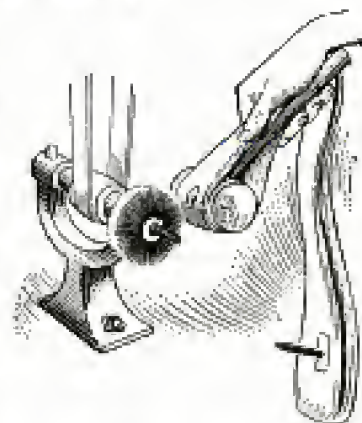
Lever Latch on Wire Gate Cannot Be Opened by Stock and Is Easily Operated

### Latch for Wire Farm Gates

Pivoted to a horizontal bar nailed between two posts, a lever, to which a suitable loop of heavy wire is fastened, will provide a good latch for a wire gate. Place the loop over the small post and tighten the gate by pulling the lever back until the gate is tight. The lever is then held by means of a small chain fastened to the post or bar as shown in the drawing, and fitted with a snap to engage with a screweye driven into the end of the lever.—Cap E. Miller, Fargo, N. D.

### Wooden Mallet Holds Inner Tube for Buffing

Buffing damaged spots on an inner tube before patching can be neatly done by using a mallet. The tube is stretched over the mallet head and held against the wheel as indicated, which eliminates the danger of the tube being caught and wrapped around the wheel, or injuring the operator.—G. E. Hendrickson, Argyle, Wis.





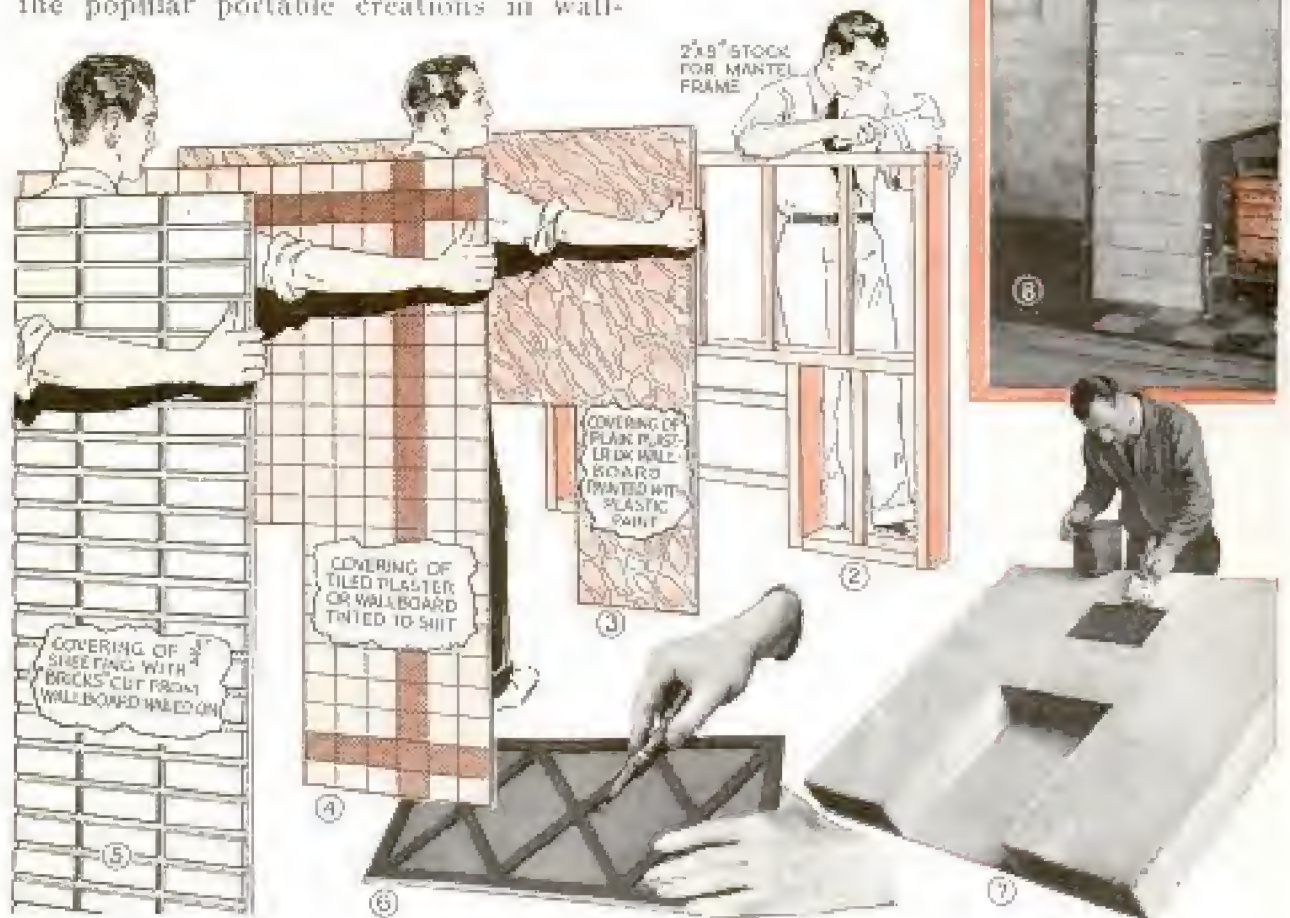
# Fireplace Construction



board, imitation brickwork, sand and shingled effects. These are especially suited for bedroom use or as a second mantel in any part of the home. The typical example shown in Fig. 1 was made from plasterboard over a wooden framework. Plastic paint was then applied to give a stucco effect. The hearth is a piece of inlaid linoleum. Woodwork in white and the opening, lined with green asbestos shingles, complete the picture. The whole story of these portable mantels should be apparent from Figs. 2 to 9, inclusive. You will notice that a wooden framework of 2 by 8-in. stock is used, and over this is nailed the face covering of wallboard, shingles, linoleum, etc. Easily made ornaments can be produced by incising heavy linoleum, as shown in Fig. 6. Fig. 7 shows a popular size of fireplace being treated

**T**HERE are many projects in fireplace construction that are absurdly simple; even the traditional wood-and-tile and the age-old brick mantel become easy after a little study.

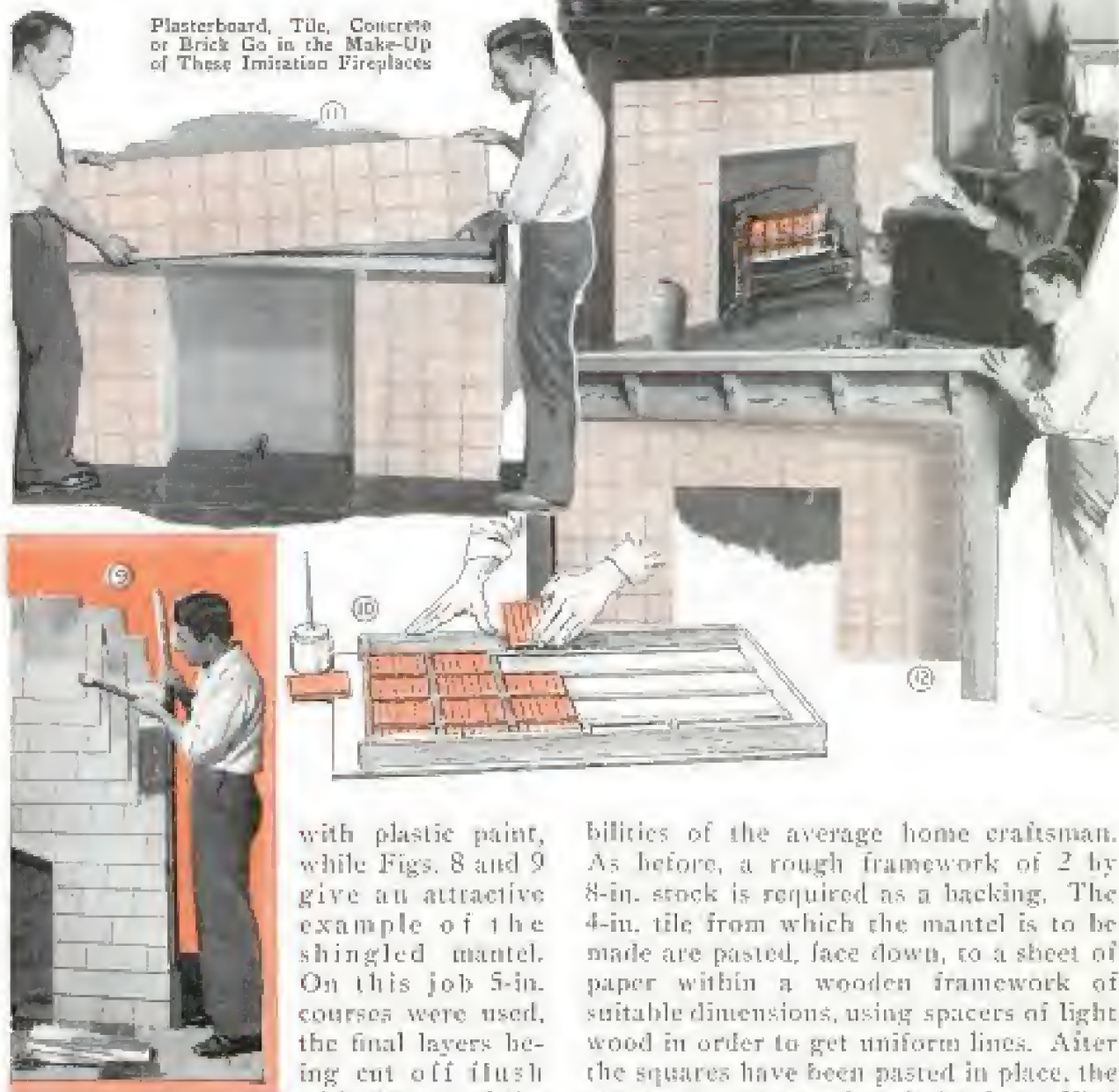
Perhaps the simplest type of mantel is the popular portable creations in wall-





# for the Small Home

Plasterboard, Tile, Concrete or Brick Go in the Make-Up of These Imitation Fireplaces



framework. The size of a fireplace depends on the room. Where there are no restrictions in the way of doors and windows, and the wall space is conveniently located, the standard size—6 ft. long by 4 ft. high, with a 24 by 24-in. opening—seems the most popular. Naturally, this can be altered to suit the room, to fit between two windows, or to conform to any other arrangement of previous construction.

For a more pretentious fireplace, the attractive wood-framed mantel shown at the top of this page furnishes a good project which is easily within the capa-

with plastic paint, while Figs. 8 and 9 give an attractive example of the shingled mantel. On this job 5-in. courses were used, the final layers being cut off flush with the top of the

bilities of the average home craftsman. As before, a rough framework of 2 by 8-in. stock is required as a backing. The 4-in. tile from which the mantel is to be made are pasted, face down, to a sheet of paper within a wooden framework of suitable dimensions, using spacers of light wood in order to get uniform lines. After the squares have been pasted in place, the spacers are removed and the form filled with a good mortar mix. Two side slabs and one top section are poured in this manner, then the sections are backed against the framework and held in place with the woodwork, which completes the mantel. Figs. 10, 11 and 12 give you the idea. Any dimensions may be followed. The hearth looks attractive and gives good service in linoleum or rubber tile. Also, the opening lined with asbestos shingles looks every bit as neat as the more difficult-to-fit bricks or tiles generally used for this purpose.

The framing for the wood-and-tile mantel may take any number of different





forms. As can be seen in Fig. 13, the top consists of two boards held together with a  $1\frac{1}{2}$  or 2-in. edging. The frame proper is made up from five boards, as shown in Fig. 14. In the cross-section view, Fig. 15, you can see how simple brackets and crown molding are used to give a costly appearance to the finished job. If the mantel is constructed without the brackets, the lower board of the box top can be fitted from narrower stock, which is quite an item when working with expensive cabinet woods, as shown in Fig. 17.

In using a gas log or heater in the fireplace, it will be found that large rooms will usually carry away any fumes that may arise. Many stoves are fitted with water compartments and are self-ventilating. To be on the safe side, however, a suitable flue of  $1\frac{1}{2}$  or 2-in. galvanized pipe should be provided. This should be led into the regular chimney opening wherever possible, but where this is not practical, the method indicated in Figs. 18 and 19 may be employed to good advantage. You will notice that this calls for a 4 or 5 by 24-in. cut to be made in the plaster. Working through this slot, which will be later covered by the mantel, you can easily pyramid 24-in. lengths of pipe upward between the inside and outside walls until some projection is reached. Sounding the point which you have reached, it is a simple matter to drill a  $2\frac{1}{4}$ -in. hole from the outside so that you can insert a 4-in. length of pipe to catch the elbow on top of the main stem. The outer end of the pipe, in this case, would be covered with a small shed in order to keep out rain or snow.

A new departure in fireplaces is the poured concrete unit shown in Fig. 20. As can be seen in Fig. 21, the whole effect is procured by means of a wooden mold, the brick markings being laid out with narrow strips of wood. After making the pattern, the mold is simply poured flush with concrete to a depth of 2 in., as shown in Fig. 22. Wire reinforcing should be set in about mid-depth, and a  $\frac{1}{2}$ -in. rod or two of metal will add materially



to the strength of the slab. End sections and fire-opening sections are poured in the same manner, and the whole thing is then assembled by means of 3-in. angles, set in the concrete while pouring. By using different mixes of colored concrete, many novel effects can be produced. The mortar lines of actual brickwork are best duplicated by brushing the seams with black or dark-gray paint. Whatever the design is, the forms must be thoroughly soaked with oil before pouring, as the concrete will not part from the mold perfectly if poured directly on the bare wood.

Even the built-up brick mantel is not so difficult if undertaken with good materials and some care in the initial lining-up. The problem of bridging the fire opening is solved by the length of  $3\frac{1}{2}$ -in. angle iron, as shown in Fig. 24. This forms a recess into which the next course of bricks is fitted. Putting on the top is simply a matter of bridging the opening with lengths of pipe or iron and laying the brick in place, as shown in Fig. 25. The wooden top to fit these concrete and brick mantels would, of course, be exactly the same as for the simpler mantels previously described.

#### Generator Brushes Easy to Fit

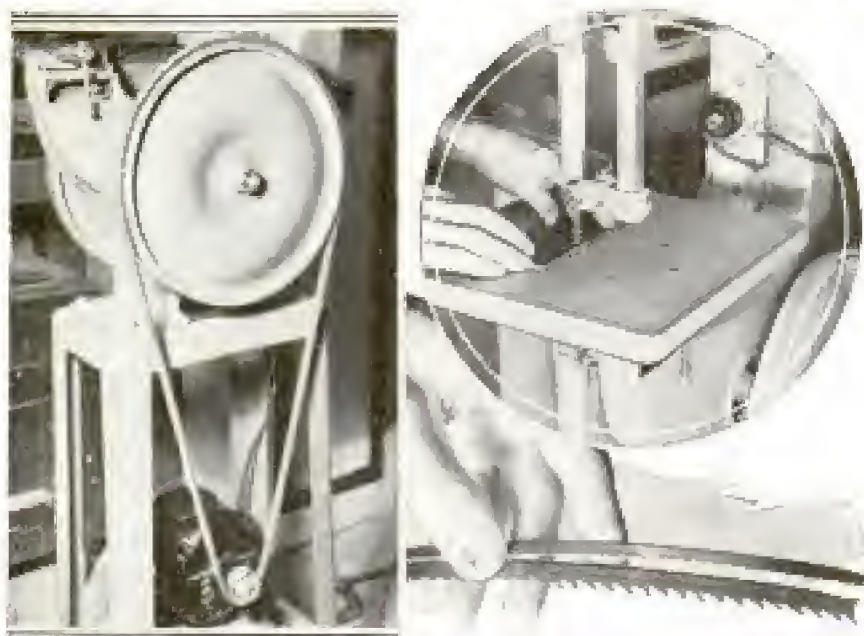
When installing new brushes in a generator, it is necessary that they bear evenly on the commutator for best results. Put the brush in the holder and raise the remaining brushes. Place a 10-in. strip of emery cloth on the commutator, abrasive side toward the brush, and give the armature one complete turn, back and forth, until the brush is cut down to conform to the surface of the commutator. Some generators are easily dismantled for this purpose, and the work is easier when the brush holders can be removed. A fine valve-grinding compound can be ap-



plied to the commutator, the holder replaced and the armature twisted back and forth until all brushes are fitted. A stiff brush and gasoline, or water in the case of a water-mixed compound, should be used to remove all traces of the abrasive.



## Cutting Sheet Metal on the Home Bandsaw



By Adding a Metal-Cutting Blade to Your Bandsaw Equipment, the Range of Work Will Include Metal Cutting, Often Necessary in the Small Shop

With a metal-cutting blade and an over-size pulley wheel on your bandsaw, you can double the usefulness of the machine. That kind of blade has fine teeth that are set and tempered like those of a hacksaw blade, and is run at a comparatively slow speed, so that a change in the pulley ratio

is necessary. Obtain an extra wheel, like those on which the blade runs, and fasten it to the lower wheel shaft instead of the regular pulley. It may also be advisable to replace the motor pulley with a smaller one, and a longer belt will be necessary. Although the face of the large wheel is flat or slightly rounded, you will find that a V-belt, a flat or even round belt will ride in the center when everything is properly aligned. The saw illustrated had a pulley ratio of about 2 to 1, giving the saw wheels a speed of 875 r.p.m. By changing both motor and saw-wheel pulleys, the ratio was reduced to less than one third of the former speed. Besides sawing sheet and other forms of metal with ease, a metal-cutting blade may be used to work lumber containing nails, without fear of ruining it.

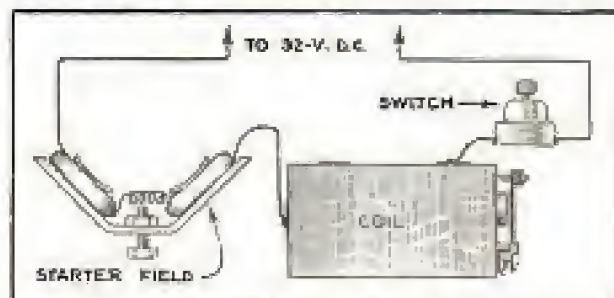
### Chain Increases Strength of Truss

When a truss is needed for heavy work, take a length of old chain, stretch it around the timber that is to form the truss and tighten by means of wedges started at the center and driven toward each end. Thus tightened the chain will strengthen the truss. The wedges can be held in position with lagscrews.

### This Armature Growler Works on a 32-Volt Circuit

Working on a 32-volt circuit, this armature tester will be of interest to shop mechanics where such current only is available. The starter shell of an old "4-90" Chevrolet is sawed in two so that the two poles serve as the tester fields. Two coils of No. 26 d.c.c. wire are wound around these poles, using all the available space which gives the right number of turns approximately. This assembly may

then be mounted on a small box and an old Ford spark coil placed inside, letting the vibrator points project so new points can be put on when needed. The primary winding of the coil is connected in the circuit of the armature-tester windings so that the vibration of the coil points will cause an interrupted current to flow



Inexpensive Armature Growler for Testing Armature Windings Will Work on a 32-Volt Circuit

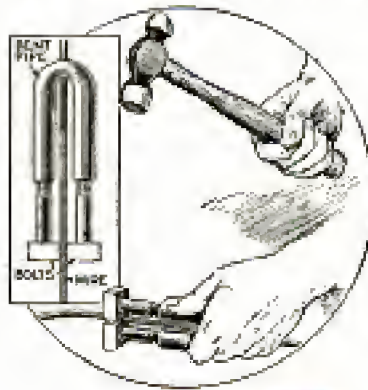
through the field windings. This sets up a fluctuation of the magnetic lines of force that flow through the armature placed between the fields for testing, and



induces a current in the windings of an armature that is in good condition. If the armature is grounded, a spark can be obtained by shorting between the shaft of the armature to the commutator. A defective coil in the armature can be detected by the amount of current generated between the segments of the commutator. A switch to control the current is placed in a convenient place on the outside of the box.

### Tool for Flattening Wire

Made from a length of tubing and two square-head bolts, this tool is useful for flattening wire before drilling holes through it. The bolts are driven into the ends of the tubing, which is bent to a U-shape so the heads will be about  $\frac{1}{2}$  in. apart as shown. A small hole is drilled through the tubing at the bottom of the "U," and the wire to be flattened is run



through the hole and between the bolt heads. By placing the tool on an anvil and striking one of the bolt heads with a hammer, the wire will be flattened.

### Paper Tubes Protect Cutting Edges of Reamers and Drills

To prevent the cutting edges of small tools, such as reamers and drills, from nicking against other tools put them into tubes rolled from strips of heavy paper. Glue the edges of the paper together and coat the outside with shellac. These covers can be removed quickly when the tools are needed, and are easily replaced after they are worn out.

### Corrugated Roofing Removed without Damage

To remove corrugated sheet-iron roofing quickly and without damage is a rather difficult job with the use of hammer and crowbar only, but is made comparatively easy by means of the tool shown. Take



a 14-in. length of  $\frac{3}{8}$ -in. flat iron, about 2 in. wide, and heat one end so that it can be bent to form a loop that will fit the corrugations. Using this as a rest for the hammer or crowbar, nails can be removed without damage to the roofing. Nail holes should be filled with roofing tar.—Luther Strosnider, Onaga, Kans.

### Damage to Axle Shaft Prevented by Reversing Nut

If a wheel puller is not available, when removing the rear wheels from a car, it is customary to drive on the end of the axle shaft with a heavy hammer. If the shaft is unprotected, this will result in expanding its end and ruining the threads. The shaft is best protected by removing the nut and replacing it reversed, flush with the end of the shaft, so that the castellations will be toward

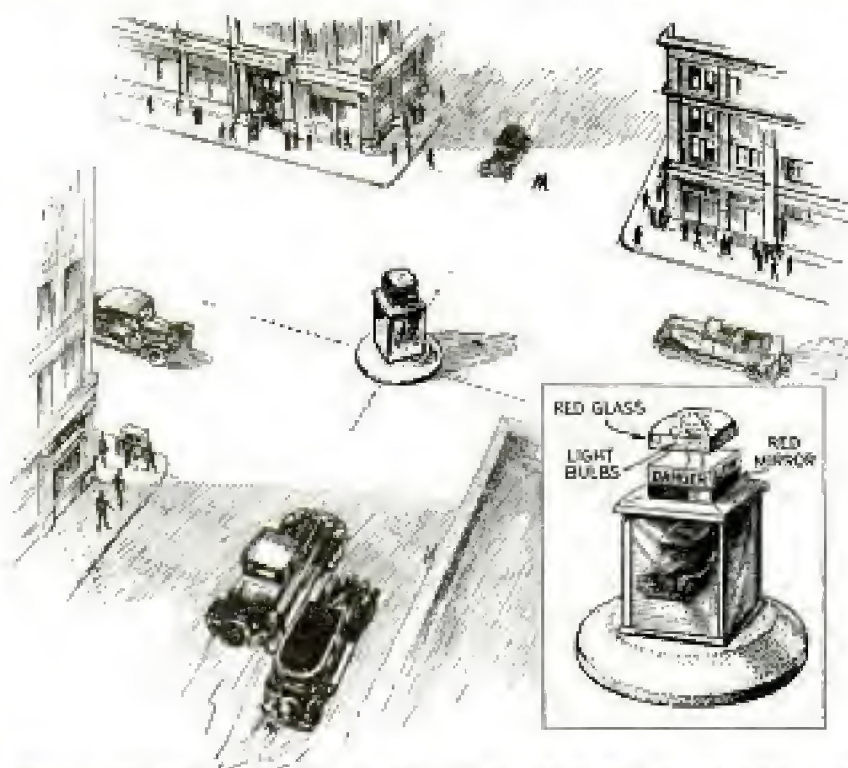
the wheel hub. A piece of babbitt metal or brass is held over the end of the shaft when pounding on it.

Flexible tubing can be made by pushing tin cans, whose ends are removed, into an inner tube, leaving the cans an inch or so apart.

### For Your Workshop

AN attractive 16 by 23-in. table giving both the decimal and metric equivalents of the fractional parts of an inch, for use in the home workshop as well as the drafting room, machine shop, garage, etc., will be sent to anyone upon receipt of 10 cents to cover mailing costs. Address Book Dept., Popular Mechanics Magazine, 200 E. Ontario St., Chicago.





Mirrors Mounted on Safety Signal in Center of Street Intersections Reflect Image of Approaching Cars to Drivers at "Blind" Corners

### Mirrors on Safety Signal Reduce Accidents at "Blind" Corners

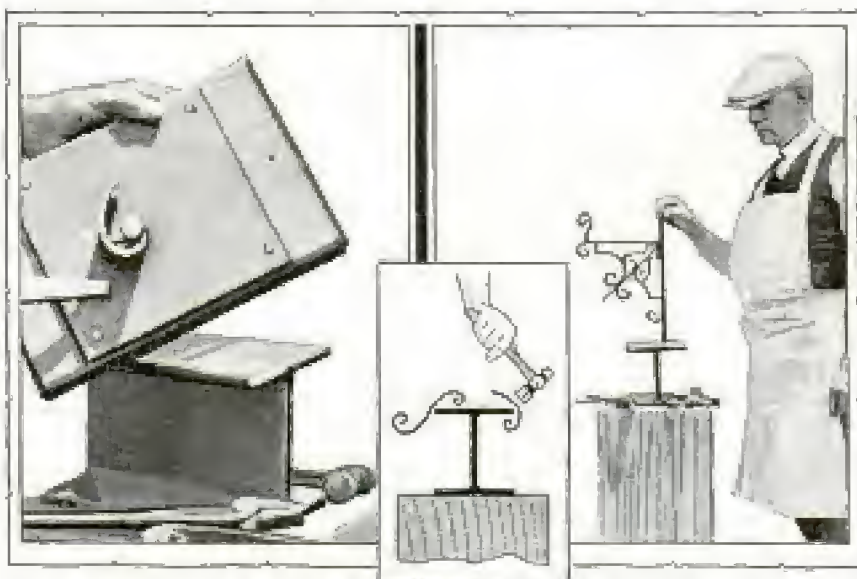
Consisting of four mirrors, set at 45° angles as shown, this safety signal will aid in preventing accidents at "blind" corners. The image or headlight of an approaching car is reflected by the mirrors and is visible to drivers coming from either the right or left intersecting street. —Geo. A. Lexander, Watertown, Mass.

### Jig for Forming Iron Scrolls

The varied possibilities of bent-iron articles will justify your building this jig for forming the scrolls. Get a piece of  $\frac{1}{4}$ -in. steel plate,  $7\frac{1}{2}$  by 8 in. in size, and cut a  $\frac{1}{2}$  by  $\frac{3}{8}$ -in. slot in the center. Then screw it to a  $1\frac{3}{4}$  by 8 by 12-in. hardwood base, the edges of which should be beveled. The scroll is made of bar iron,  $6\frac{1}{2}$  in. long, heated and bent to shape, then attached to the steel plate and block with a  $\frac{3}{8}$ -in. machine bolt and a  $\frac{1}{4}$ -in. pin, which is riv-

eted to the outer end of the scroll. The base should be countersunk so that the nut and washer will be flush with the bottom. When using the jig in a vise, a 1 by 2 by 10-in. block is bolted to the base, but on an anvil, the jig simply can be clamped. It is preferable, however, to make use of the vise or to fasten the jig on a bench, reserving the anvil for other operations. The jig is for medium-sized scrolls, adaptable for almost any design. Larger or smaller scrolls can be made by following the same plan, and using the same plate. If a fan-shaped end is desired, the stock should

first be heated for 1 or 2 in. from the end and hammered with the peen end. A slight arc should be made on the hammered end so it will conform to the inner curve of the jig when inserted into it. When thus started, the stock is reheated for at least 4 in. of its length, inserted into the jig and held for bending by a clamp bar in the slot. The bar is 12 in. long and  $\frac{3}{4}$  in. wide, and is tapered at one end to  $\frac{1}{4}$  in. With this jig scrolls can be made very rapidly, subsequent curves or angles being made over an anvil.



Easily Constructed, This Jig Will Greatly Simplify the Forming of Scrolls in Ornamental-Iron Work

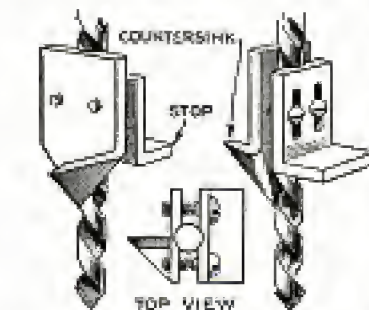


### Chain Holder for Small Tools

A short length of straight-link chain, that is worn so that it will not stand any strain, can be utilized as a tool holder. Stretch it between two points on the back of the workbench. Half of the links will be in a horizontal position and can be used for holding tools such as chisels and screwdrivers, while the other links, being in a vertical position, will provide places for tools that can be hooked into them.

### Adjustable Countersink Clamps to Drill Bit

By clamping a stop and countersink attachment to a drill bit, holes can be drilled and countersunk in one operation. Two pieces of steel are used, one for the countersink and the other for a stop. The countersink is bent to the shape shown in the left-hand detail, after which the bent edge is sharpened to a bevel. It is then drilled and tapped for two small screws and slightly grooved on the back to fit the



bit. The stop is bent at right angles and slotted to correspond with the holes in the countersink. These slots allow it to be adjusted for depth of countersink. A groove is then cut in the back of the stop

similar to that on the countersink. The assembly is clamped to the bit by inserting screws through the slots in the stop to engage with tapped holes in the countersink.

### Metal Horse Equipped with Roller Supports Long Work

Here is a handy steel horse for general purposes in the shop. The legs are made of 4-ft. sections of 2 by 2-in. angle iron, bent 16 in. from the top as shown. The vertical portions of the legs are joined together by riveting a section of  $\frac{1}{2}$ -in. metal plate to them, and a number of  $\frac{3}{8}$ -in. holes are drilled through this piece to ac-

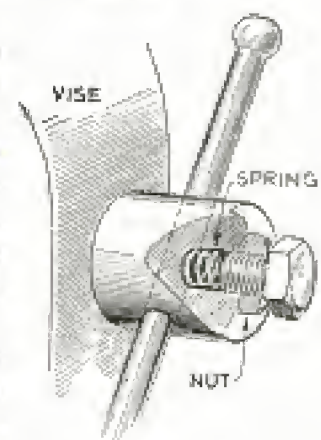


Metal Horse, Fitted with an Adjustable Roller, Is Useful for Supporting Long Work

commodate a  $\frac{3}{4}$ -in. iron rod. A roller, made of 2-in. pipe, 30 in. long, with steel disks welded on each end, is slipped over the rod, holes being drilled in the center of the disks for this purpose. Two cross-pieces of  $1\frac{1}{2}$  by  $1\frac{1}{2}$ -in. angle iron are riveted to the legs to hold material when the roller is not desired. Other braces are bolted to the legs, for the purpose of providing additional rigidity. Adjustment for height can be obtained by raising or lowering the roller.

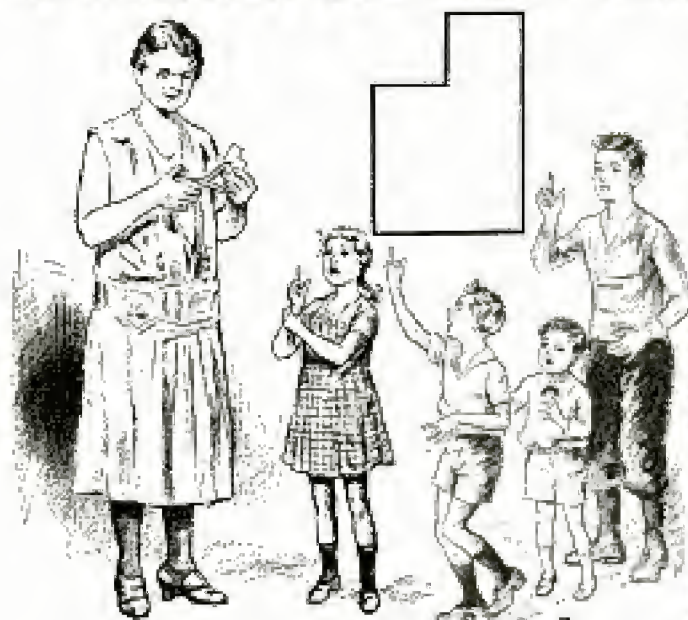
### Compression Spring Holds Vise Handle in Position

Inserted in a  $\frac{1}{2}$ -in. hole drilled in the end of a vise screw, a compression spring can be used to hold the handle as shown. Drill the hole through the screw head to meet the hole for the handle as indicated, and insert the spring. Weld a  $\frac{1}{2}$ -in. nut over the hole and drive a  $\frac{1}{2}$ -in. bolt through it to compress the spring against the hand lever of the vise.—George Madsen, Chicago.

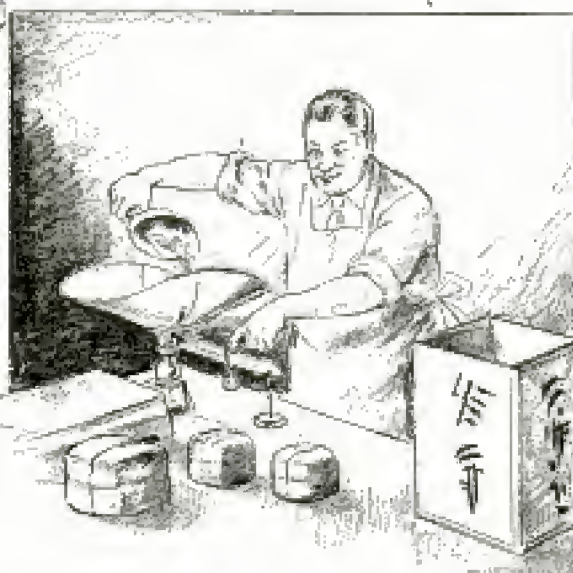




# Can You Solve *these* Puzzles?

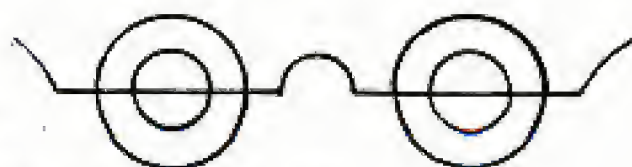


Let us imagine that the figure is produced by the laying down of four separate wires of uniform length, all bent into the same shape, and not crossing. What will be the common shape of those four interlocking wires?



WHILE tidying up stock, Groceryman Miller encountered a natural puzzle in a fifty-pound tea chest. There was an even number of pounds left in it, and this quantity Miller wrapped up in five lots, the quantities being whole numbers of pounds. "It struck me as a coincidence," relates Miller, "that the total number of pounds in the five packages was evenly divisible by five numbers only, which correspond to the five lots." Who can tell what those five quantities were?

"OLD Specs" is a simpler specimen of the second puzzle, and its solution will be good preparatory exercise for the greater task of analyzing the nine-cell design. Copy the design without taking pencil from paper, and never retracing or crossing the line.



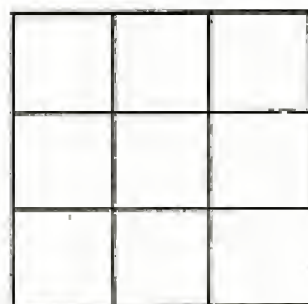
*Halsey H. Brooklyn 53*  
By SAM LLOYD

EACH of four children burned a finger on the Fourth of July, and Mother Jones had in her medicine cabinet only a small piece of courtplaster, corresponding in shape to the design shown.

Now, if the children had been five, rather than four, in number, it would have been no problem to divide the plaster. However, Mrs. Jones seized her scissors and snipped the remnant into four pieces of uniform shape and size.

Who can mark off that figure into four parts of similar shape and size?

INSPECTION of a square containing nine cells, reveals that at eight points of intersection the number of branches is odd. The rule for such puzzles is to divide the total number of odd nodes (points of intersection) by two, to determine the number of continuous lines necessary to construct the figure. So, this design will require a minimum of four separate continuous lines, if the retracing or crossing of a line is prohibited.



Answers to the above puzzles will be given in the next issue



# Chromium Plated "YANKEE" TOOLS

... these finest of fine tools, made finer still, and more than ever desirable as gifts to men and boys.

**ALWAYS** like new ... Chromium Plating over nickel on "Yankee" Tools adds beauty and durability at no increase in price.

Your hardware man will tell you what "Yankee" Tools to buy for the mechanic; what to buy for the handyman; for a boy. Use coupon below to get "Yankee" Tool Book.

# "YANKEE" TOOLS

MAKE BETTER MECHANICS

NORTH BROS. MFG. CO., Lehigh Avenue, Philadelphia, U. S. A.

Readers of Popular Mechanics, who like to own good tools, are invited to send this coupon for "Yankee" Tool Book (free) illustrated with action pictures of "Yankee" Tools in use, showing how these ingenious tools save time and labor.

Name.....

Address..... (pm)

When writing to advertisers please mention Popular Mechanics



"Yankee" Spiral Ratchet Screwdriver No. 30-A drives all sizes of screws, simply by pushing on the handle. Price, \$3.00, including three bits, of varying sizes.

To bore holes for screws, everybody needs a "Yankee" Automatic Push Drill No. 41—with eight sizes of drill-points, 1/2" to 1 1/4". Price, \$2.60.

"Yankee" No. 15—a ratchet driver, has thumb-turn on blade for starting wobbly little screws with thumb and forefinger. Price (4-in. blade), 80c.

No. 90 is a husky "Yankee" plain screwdriver that stands all sorts of use and abuse. Price (8-in. blade), 75c.

The finest tool to give mechanics or amateur is a "Yankee" Ratchet Bit Brace No. 2100. Lucky man, who gets it! Price (10-inch), \$5.20.

"Yankee" No. 1530 Ratchet Hand Drill (above), and No. 1555 Ratchet Breast Drill are fine gifts for motorists. These drills have five ratchet adjustments; they work where others can't. Price: No. 1530, \$5.25; No. 1555, \$11.00.

"Yankee" Tool Set No. 105.—Ratchet tool holder with nine attachments. For the man who works on radio and home electric appliances. Price, \$3.25.







### For Rainy Day Shooting—

When you get your Daisy be sure to get one of the new Daisy Targets made of fine sheet steel, with patented device to drop shot and keep it from flying. Folds to fit pocket and can be set up anywhere. Great for rainy-day practice in house, cellar or garage.



## Rifle Teams— 1932 Style!

Where could a boy find a better partner than his own father, or one better adapted to teach him to be a keen athlete and a good sportsman?

In golf, tennis and shooting you see father and son teaming up together, and every time it's a winning combination.

Many fathers today realize that there's nothing that will promote good fellowship and understanding like target practice. A little stiff competition over the shining barrel of a rifle will do more to help you and your son get better acquainted than anything else.

With a Daisy Pump Gun handy, the "old-man" can prove to the youngster that mature judgment and steady self-control count for success both in business life and in sport. And the youngster can give his dad some real stiff competition when it comes to keen sighting and quick trigger action. If you haven't tried it, get in on this fascinating sport without delay.

DAISY MANUFACTURING COMPANY, PLYMOUTH, MICHIGAN, U. S. A.

And when you have developed some real skill as a team, you can challenge the neighborhood. There's rare sport to be had in front of a target with a crowd of good fellows, young or old, equipped with Daisy Pump Guns.

If you have thought of the Daisy Air Rifle as merely a toy, you haven't seen this new improved Daisy Pump Gun. This remarkable rifle is the finest boy's gun ever made, with polished walnut pistol-grip stock, and slide action, a true replica of the rifle used by big-game hunters and explorers. A safe gun, and remarkably accurate in its range.

Get the boy this new Daisy for Christmas, and start off the new rifle team for a winning year in 1932. Ask your dealer to show you this famous rifle, a 50-shot repeater for only \$5.00. Other Daisy models, \$1.00 to \$5.00.

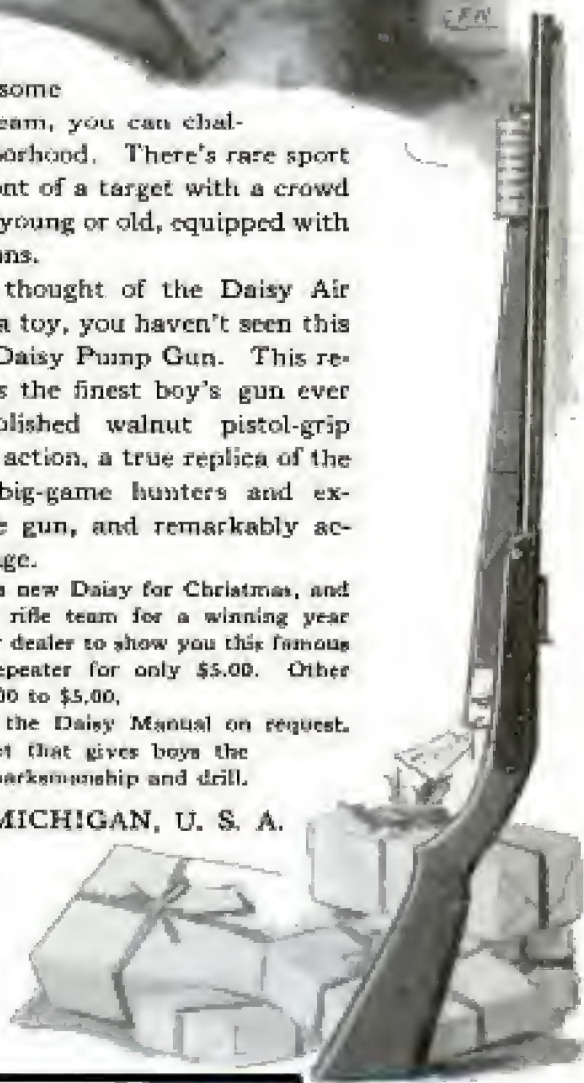
A free copy of the Daisy Manual on request. A valuable booklet that gives boys the fundamentals of marksmanship and drill.



# DAISY

## AIR RIFLES

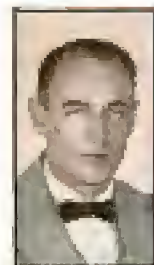
Use Bull's Eye Steel Shot, the cheapest, truest shot for all Air Rifles.





# Hello boys!

## 1000 Toys in One — Build 'em yourself

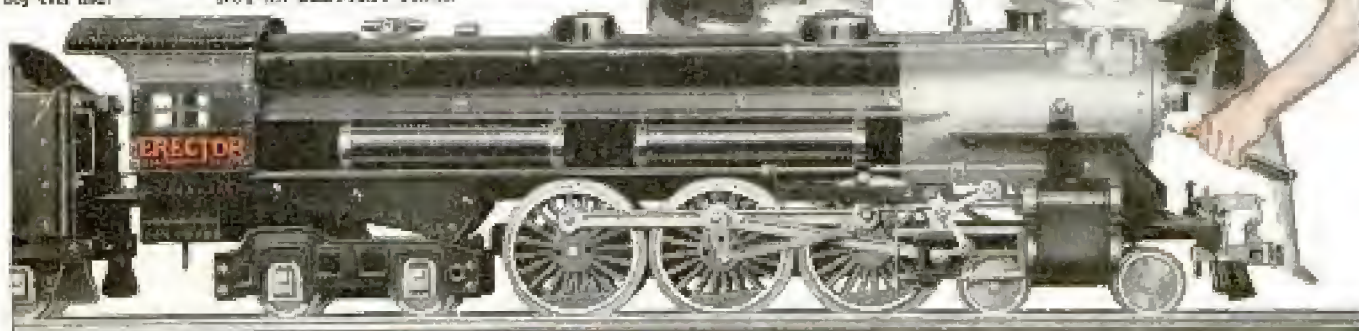


Millions of boys know Mr. A. C. Gilbert, champion athlete and champion maker of almost boys' toys. He has devoted his life to the work of making Erector what it is today, — the most exciting sport any boy ever had.

### 1931's TOY SENSATION

Adapted reproduction of the New York Central's great flyer, the locomotive of the 20th Century Limited. Built entirely with Erector. And you can build hundreds of other realistic models too.

NOT AN ELECTRIC TRAIN



with **ERECTOR** the World's Champion Toy

### Be a real engineer

Step up, boys, and see a railroad locomotive built, right before your eyes. Watch a big steam shovel constructed, part by part.

Not by great engineers, but by boys just like you. Why, you yourself can reproduce the greatest feats of the world's famous engineers! You don't know how smart you are, you haven't even dreamed of the exciting thrills a boy can have, until you open up a set of my new Erector.

### Be the wonder of your neighborhood

Your friends will flock to your home to see you build things with Erector. Excitement! Boy, Erector brings you thrills you never thought possible and fun you'll never forget, no matter how long you live. Once you get your Erector, you'll be sitting on top of the world.

### My crowning achievement

Boys, I've worked many years making Erector better and more exciting every year. Last year boys by the million called Erector the world's greatest toy. But the 1931 Erector is far more than a toy! It dwarfs all my previous efforts. It is the pathway to engineering fame for clever red-blooded boys the world over. It is

the most exciting sport any boy ever dreamed of.

### They hum with action

Yes sir! With Erector you can build real models of great locomotives, traveling cranes, ferris wheels, airplanes, and hundreds of other modern inventions.

But that's not all. When you've built them with your own hands, hook them up to the powerful Erector electric motor, and they go into action just like the big ones that engineers build. Erector brings you more real sport and fun than a whole year of 4th of July's.



### What you get with Erector

Lift the lid of the red brass-bound chest in which Erector comes to you. See the hundreds of Erector parts. Steel girders with interlocking edges, both straight and curved, made of real structural steel. Wheels, gears, boiler, steam shovel, pulleys, cranes, axles, and many other parts for building hundreds of models. But that is not all. No sir! You also get the powerful Erector electric motor and many other feature parts, for automobiles, aircrafts, and other models. All Erector parts are interchangeable. Every part necessary to build Erector models comes with Erector.

With Erector comes the big Erector "How to make 'em Book" which pictures and describes every step in the building of such and every model. Any boy who can read can be a boy engineer with Erector.

### How to get Erector

There is something about Erector that will fascinate your Dad.

Send for the Erector catalog (see coupon). Show it to your dad. Take him to the nearest toy store. Let him see the sport and scientific thrills that only Erector can give. Christmas will soon be here. Tell your dad Erector is what you want. He'll be pleased, and he'll probably sit on the floor with you Christmas morning and help you build your first Erector model.

### 95 cents and up

Even though I've improved Erector this year, I've also reduced Erector prices so that more boys can share the thrills of building engineering models. Of course, the bigger the set, the higher the price. But there is an Erector set for almost any price your Dad wants to pay. I wish you a merry Christmas and hundreds of happy days next year with Erector.

### FREE . . .

The first 100,000 boys who mail the coupon will get, free of charge, a genuine specimen Erector "How to make 'em Book" which shows exactly how to build thrilling Erector Models, together with the big handsome colored catalog of Erector models and sets. Get your coupon into the mail today, boys, for 36 pages of exciting pictures, diagrams and description.

THE **ERECTOR**



The A. C. Gilbert Co.,  
240 Erector Square New Haven, Conn.  
Please send me free copies of:  
A. C. Gilbert's genuine specimen Erector  
"How to make 'em Book" and the big colored  
catalog of models and sets.

Name.....  
Street.....  
City.....State.....





## When You CAN'T QUIT

Nerves on edge. A head that throbs. You can't stop work, but you *can* stop the pain—in a hurry. Bayer Aspirin will do it every time. Take two or three tablets, a swallow of water, and you're soon comfortable. There's nothing half-way about the action of genuine aspirin. If the box says Bayer, you'll get complete relief.

These tablets should be in every shop, office, and home. Ready to relieve any sudden ache or pain, from a grumbling tooth to lumbago. Don't suffer with neuralgia, neuritis, rheumatism, etc. Don't lose time because of colds or sore throat. Get some Bayer Aspirin and read the *proven* directions for instant relief.

Be sure to ask for Bayer Aspirin it does not affect the heart.

# BAYER ASPIRIN

When writing to advertisers please mention Popular Mechanics



IT'S AS NEW  
as the NEXT MINUTE  
ON YOUR CLOCK

The Wiggins Compact Binder Card Case is *today's* idea of a really modern and beautiful carrier of fine cards—that always keeps your cards clean, available, respectable. Scored cards bound firmly together in tab form with issues between each cannot flop around and become soiled when carried in our neat genuine leather case insuring 100% use of cards.



You'll like its quick handiness—its compact efficiency—its beautiful appearance.

Naturally, it requires fine cards—Wiggins engraved cards—to make the quality combination complete. Would you like to receive sample tab of the kind of fine cards you have always known you wanted and needed? They'll gladly be sent on request—together with full description and prices.

The JOHN B. WIGGINS  
Company

1167 FULLERTON AVE. • CHICAGO



## "FLYING CLOUD"

Get clean-cut parts and clear blue-prints for 20" model. Readily made in spare hours as hull fully shaped and sanded. But includes anchor, hull, capstan, dead eyes, wheel, rigging line, etc. Complete for \$11. Postage 5 lbs. White metal fastenings 5 lbs. Send 10c cent for beautiful catalog of ships and coasters.

ROY HANCOCK

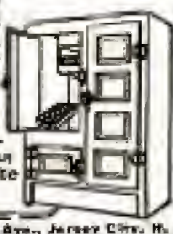
323 Douglas Ave., Portsmouth, Va.

## BUILD YOUR OWN AUTOMATIC ELECTRIC REFRIGERATOR



Why pay \$200.00 and upwards? Use your present free-box. We supply parts. Can be built for only \$34.00. Easily made. No special tools necessary. Operating cost, quality and size of machine same as well known makes. Complete blueprints and instructions—\$1.00. Quantity "10" as request.

B. & L. ENGINEERING CO., 708 Bergen Ave., Jersey City, N. J.



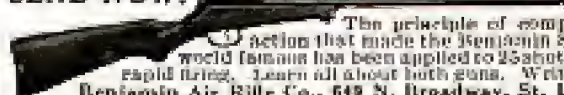
## DO YOU

WANT a new business profession of your own, with all the trade you can attend to? Then become a foot correctionist, and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. Address Stephenson Laboratory, 1 Back Bay, Boston, Mass.

## FREE

Get BB Magic at once. A wonderful shooter's delight—teaches to hold, aim and handle rifles; helps you guide others in correct knowledge of guns. Gives facts that make crack shots. Gives safety and common sense instruction parents all like.

SEND NOW!



The principle of compressed air action that made the Benjamin Single Shot world famous has been applied to 25 shot automatic rapid firing. Learn all about both guns. Write Benjamin Air Rifle Co., 649 N. Broadway, St. Louis, Mo.





— USE STARRETT HACKSAWS —

# They get paid for ACCURACY: so do you!

Whether you make your living in the air, with the stick of a pursuit plane between your knees... or in a shop, at the controls of a lathe or planer... it's your *accuracy* that counts.

It's your accuracy that says whether or not they can do without you. It's your accuracy that sets your rank... and the size of your checks.

Whatever you do, it pays... *big*... to be known as the most accurate man in sight.

To give your skill a chance, take



Starrett Micrometer No. 230,  
Range 0 to 1" by thousandths.

a tip from the crack pilots: *make sure your equipment is right*—just as right as human ingenuity can make it. If you work with tools, that means *Starretts*.

There are tools cheaper than Starretts—just as there are planes cheaper than the Army's. But no tools are better than Starretts. No tools make it easier to get the deadly, day-in-and-day-out, split-thousandth accuracy that makes you and your work worth more.

Determine now to own the Starrett Tools you need. Send the coupon for the latest Starrett Catalog No. 25 AP. It describes and prices over 2500 Starrett Tools for machinists, auto and air-plane mechanics and carpenters; shows how to use them; contains many tables and general data.



Wright inspector checking the camshaft idler shaft of a Curtiss-Wright Conquest engine with a Starrett Micrometer No. 2. The dimension is 1.0005 plus or minus .0005.



For accurate work, in either wood or metal, use Starrett Tools.



# Use Starrett

THE L. S. STARRETT CO., ATHOL, MASS.  
Please send me my free copy of Starrett Catalog No. 25 AP  
Name \_\_\_\_\_ Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

# Tools



## How to Repair a Cracked Water Jacket

with

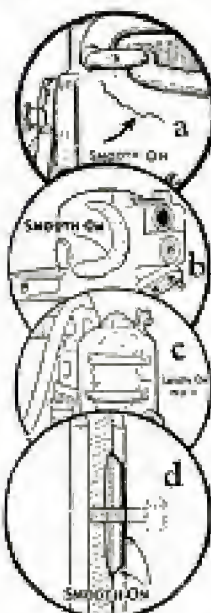
### Smooth-On No. 1

No disassembling and no heat!

- Simple crack.** Force Smooth-On No. 1 into the crack and give it a few minutes to metallize.
- Long crack.** Put the Smooth-On under a metal plate, held with cap screws.
- Piece broken out.** Fit the piece back with Smooth-On in the break, and bind with metal straps.
- Holes or thin spots.** Cut weak metal away, bevel back, fit with manhole plate, and force the Smooth-On in tight with screw. To make an extra neat job, cut off outer end of screw.

Use Smooth-On also for stopping all water, oil, gasoline or exhaust gas leaks and for tight hold at screw threads of nuts, hub caps, etc.

Get Smooth-On No. 1 in 7-oz., 1-lb. or 5-lb. tins at any hardware store or if necessary direct from us.



Write for  
**FREE BOOK**



## Do it with SMOOTH-ON

SMOOTH-ON MFG. CO., Dept. 37,  
574 Communipaw Ave., Jersey City, N. J.

Please send the free Smooth-On Repair Book.

Name.....

Address.....

**Return this coupon for a  
FREE copy of Booklet**

12-31

When writing please mention Popular Mechanics

# CROSLEY

New Pentode Output Variable Mu  
**SUPERHETERODYNE**



## \$36.36

Complete With Tubes

### The Crosley LITLFELLA

NOW your Crosley dealer is ready to show and demonstrate the new Crosley LITLFELLA—a 3-tube table model SUPERHETERODYNE radio receiver incorporating big set features yet housed in an exquisite and convenient cabinet of choice veneers, 17 inches high and priced sensationally low, Pentode output, Variable Mu tube, full floating moving coil dynamic speaker, continuous (stepless) static and tone control, combined volume control and on-off switch, illuminated dial with vernier drive—such features as these make The Crosley LITLFELLA the greatest of all radio values. Only \$36.36 complete.

Crosley also offers a series of 8-tube Push-Pull Pentode Output, Variable Mu SUPERHETERODYNE models ranging from The PLAYBOY, a beautiful compact table model at only \$49.75, complete with tubes, up to a magnificent grandfather electric clock and radio at only \$95.00, complete with tubes. Also The TEN-STRIKE, a table model 10-tube Push-Pull Pentode Output, Variable Mu SUPERHETERODYNE with METER TUNING at \$69.50, and The HAPPY HOUR, a six legged console at \$99.50, both complete with tubes. Send for circular E-12.

(Western prices slightly higher.)

The Crosley Radio Corporation

POWEL CROSLEY, Jr., President

Home of "the Nation's Station"—WLW  
CINCINNATI

## YOU'RE THERE WITH A CROSLEY CROSLEY RADIO



Forms to cast Lead Soldiers, Indians, Trappers, Hunters, Wild and Farm Animals. 239 different forms to select from. Every Form guaranteed to cast perfect figures. Send 3c stamp for illustrated catalogue.

HENRY C. SCHIERCKE SPENCER RD. GHENT, N. Y.

## Keds

At \$1.00, \$1.25, \$1.50  
\$1.75 and up to \$4.00.

United States Rubber Company



## INCREASE YOUR BUSINESS

by using the NEW  
\$5.85 "Two-Faced"  
Film duplicator to make 100 copies, in 1 to 5 Colors  
each time. Or the \$37.05 "Excaligraph" Rotary  
Stencil duplicator to print copies of anything typed,  
Penned, Drawn or Traced in numbers  
up to 3000 each operation, as Price  
Lists, Hand Bills, Special Sales  
Announcements, Bulletins,  
Menus, Quotations, or "what  
have you?" Write—

Easy Terms

**PITTSBURGH TYPEWRITER & SUPPLY CO.**

Suite 552,

339 Fifth Avenue

Pittsburgh, Pa.

Copyrighted material



# $\frac{1}{112}$ of a second is a "RIPE OLD AGE" for gasoline in your motor

A TINY FLASH—and the spark plug sets gasoline ablaze in your motor;  $\frac{1}{112}$  of a second—and there is nothing left. The gasoline has burned out and died. Yet in that seemingly brief "lifetime" gasoline has done its job. It has delivered power to your piston—which in turn sends this power to your rear wheels.

When you are pulling up a steep grade or spurring away at the flash of the green light, your engine is under strain. This is the acid test for gasoline. At these times, ordinary gasoline proves to be too "short-lived."

It starts to burn smoothly. But right at the crest of its power it bangs in a fast explosion that slaps against the cylinder walls. *It fails to deliver its full power.* This too-sudden explosion results in harmful knock, power waste, overheating.

That is why nearly all leading oil refiners now add Ethyl fluid to their tested gasoline. Special slow-motion movies show that the magic drops of Ethyl fluid in Ethyl Gasoline *control combustion at all times*—even when the motor is under severe strain. Ethyl Gasoline delivers all its power smoothly, evenly, with a steadily increasing pressure that lets your piston take full benefit of it.

Use Ethyl the year 'round. See how it increases power, gives quick get-away and sends you zooming up steep hills in high. Try it tomorrow. Ethyl Gasoline Corporation, New York City.



The better ingredients used in Ethyl fluid to lead



## Special slow-motion movies show "Life Span" of gasoline inside your engine



This is how ordinary gasoline burns under strain. The vertical line of light shows the almost instantaneous flash that signals its sudden death! See how short its life is in contrast to the picture below.



This is how Ethyl Gasoline burns—whether your motor is merely idling or under strain. The Ethyl fluid in it controls combustion, making gasoline burn evenly throughout its relatively long life.

# ETHYL GASOLINE

When writing to advertisers please mention Popular Mechanics

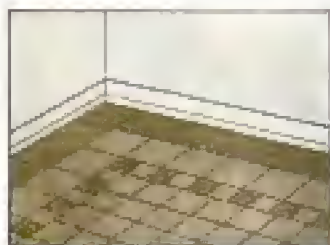
Copyrighted material



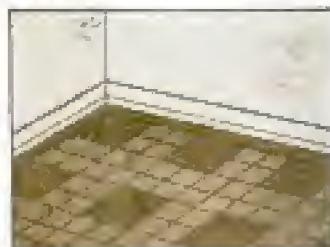


*New in method  
style and mode*

## MASONITE *Cushioned* FLOORING OF TEMPERED PRESWOOD



*This illustration shows an interesting three-border effect, with smaller squares alternating in light and dark shades.*



*In this illustration, the reversible shades produce a pleasing effect with smaller squares. Wax or polish Masonite Cushioned Flooring, if you wish. Takes it beautifully.*

First in this remarkable Masonite family came Structural Insulation and QuartRboard, next Presdwood, then Tempered Presdwood . . . and, now, *Masonite Cushioned Flooring*—both a flooring and a floor covering, new and modern in method, style and mode.

As its name suggests, it has an in-built shock absorber, which eliminates much of the fatigue and discomfort from walking. It is of three-ply construction—outer layers of *durable, wear-resisting* Tempered Presdwood, impervious to moisture and specially toughened by a process similar to that used in tempering steel; an inner layer, or cushion, of QuartRboard to provide resiliency, insulation, and sound absorption.

Masonite Cushioned Flooring is *beautiful*, with endless combinations of design and pattern. It is *economical*, in first cost, in application, in long life, in elimination of floor covering.

Architects, contractors, home and building owners appreciate its practical features, its utility either in new construction or modernizing. Note its distinctive points listed on opposite page. Also send coupon—today—for folder giving complete facts.

CROSS-SECTION OF MASONITE CUSHIONED FLOORING . . . OUTER LAYERS OF TEMPERED PRESWOOD . . . INNER LAYERS OF





### Ten points of superiority

1. **Appearance**—Smooth, beautiful, grainless squares and borders.
2. **Durability**—Built to withstand wear; Tempered Preswound surfaces assure long service.
3. **Style**—Something entirely new.
4. **Resiliency**—Quasi Ebonized cushion makes walking easy and restful.
5. **Grainless**—An all-wood flooring, yet free from splinters.
6. **Perfect Joints Interlocked**—Tongue-and-groove construction provides smooth, snug fit.
7. **Easily Laid**—Can be either nailed or cemented.
8. **Variety of Designs**—No end to patterns—6, 9, 12-inch squares; borders 3, 6, 12 inches wide; 47 inches long.
9. **Reversible Squares**—Dark on one side; light on other.
10. **Flooring and Floor Covering**—All in a single unit.

# Masonite

*Cushioned* **FLOORING**

STRUCTURAL INSULATION • INSULATING BATH  
PRESWOUND • QUARTERBOARD

*Note the tongue-and-groove construction of the squares. Tight-fitting joints, a perfectly smooth floor.*



*Clip out the coupon below. Send it in today, with your name and address. You'll find much to interest you in the free Masonite Cushioned Flooring folder it brings.*

MASONITE CORP., Dept. L-111  
141 W. Washington St., Chicago, Ill.

Please send your free illustrated folder that describes Masonite Cushioned Flooring. @M.C., 1931

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

QUARTERBOARD...NOTE REVERSIBLE COLORS AND INTERLOCKING JOINTS

When writing to advertisers please mention Popular Mechanics

Copyrighted material



**She's  
a  
fighter  
mates!**



## Build and Sail this Mighty All Steel Superdreadnaught

Here's a ship that will make your blood tingle. A racing, racing building of the Navy. All steel from stern to stern—built just like Uncle Sam's mighty monarchs of the sea. You build this gigantic warship yourself. Lay the keel like they do in the big Navy Yards, fit on the hull and armor plate and mount the guns. But the big moment is when you launch her—when you see her awaken to a proud sea life and go forward under her own power. You can build all kinds of thrilling ships with this wonderful Meccano Ship Building Outfit. Gigantic ocean liners—dashing speed boats—adventurous pirate ships—and many others. In the sturdy, green Meccano Sea Chest you will find everything you need for building real ships—vessels that actually float and run.

# MECCANO

"The Toy that made Engineering Famous"  
"Just Count the Holes"

Meccano means better and easier model building. The famous Meccano flat beams and angle beams have equally spaced holes (1/4 in. apart). You just count the holes. Also, Meccano gives a connection or bearing wherever it is needed. Interchangeable with other construction toys.

- No. 1.** Solid Steel Ship Hull, 28 in. long. Built to float and run. Other exclusive ship features—ship funnel, decks, keel, propeller, pilot house, and many others. (In No. 112 Meccano Outfit and up.)
- No. 2.** Meccano Patented Super-Power Unit (Combination Electric Motor and Gear Box). Again—just count the holes. Adapted for simple reversing connections. (In No. 5 Meccano Outfit and up.)
- No. 3.** Patented Meccano Two-Drum 110-volt Electric Hoisting Engine. Equipped with famous 110-volt Polar Cap Motor. Multiple disc clutch. Majestic replica of a genuine hoisting engine. A complete operating unit for building hoisting machinery, derricks, cranes, elevators, etc. (In No. 125 Meccano Outfit and up.)
- No. 4.** Patented Meccano Braced Girders, 12 in. long, 2 in. wide.
- No. 5.** Solid Steel Disc Wheels with genuine Dunlop solid rubber tires. Fascinating fun, stupendous surprises, thrilling adventures in mechanical mysteries—they are yours with Meccano. Meccano is carried by all leading department stores. Go in and see the wonderful Shipbuilding Outfit and other Meccano Outfits—priced from \$1.00 and up. Take your Dad along. He will be as eager as you to have a Meccano Outfit.

### Join the Meccano Engineers

The greatest boys' engineering club in the world. Be the first boy in your set to join. Handsome membership badge sent free. Also illustrated book on Meccano. Clip coupon today.

**THE MECCANO ENGINEERS.**  
512 Meccano Circle, New Haven, Conn.

I want to join the Meccano Boy Engineers. Please send free Membership Badge and copy of free book on Meccano.

Name.....  
Street.....  
City..... State.....

When writing to advertisers please mention Popular Mechanics

## Big \$1 XMAS GIFTS

Value 1 SEND FOR CATALOG P.M.

Best value you  
eversaw. Genuine  
leather, attractive  
looking card case,  
gold corners, holds 5  
cards also extra pocket.  
et. Masonic or other  
emblem stamped in  
gold, FREE. Name and  
other stamping \$3.50  
line . . . . . \$1  
9 windows . . . \$1.50  
15 windows . . . \$2.00



### SOLID GOLD PINS



Just the right size.  
Masonic, Chapter, 32nd Degree, Shrine,  
Grotto, De Molay, etc. . . . . \$1  
Catalog lists hundreds.

### NOVEL CHARM

A most mysterious Masonic watch  
charm of heavy plated gold.  
Square and compass show when  
revolved. Delights owner . . . \$1



### MASONIC XMAS CARDS

Send one to your friend, 15 specially  
selected. Beautifully engraved.  
Also Shrine, Eastern Star & De Molay \$1

Money back if not satisfied

**REDDING MASONIC SUPPLY CO.**

Dept. P.M., 200 Fifth Ave. Est. 1859 New York

"EVERYTHING MASONIC"



## Do Your PRINTING

Cards, stationery, circulars, tags, labels, advertising, etc.  
Save money. Print for others, big profits; easy rules sent.  
Will do popular Raised Printing like Engraving. Junior  
Press, \$5.00. Job Presses \$31 up. Power \$149. Write for  
free catalog. **THE KELSEY CO., Y-37, Meriden, Conn.**



## MOULDS

For Making Toy Soldiers,  
Indians, Cowboys, Animals, etc.

With one mould you can make many HUNDREDS OF CASTINGS.  
Whole Armies, Outfits, including material for casting, enamel  
paints and everything complete \$3.00. Easy enough for any boy to  
make and great fun for grown-ups. Sport for the whole family.  
Beware of imitations—insist on "MAKE-A-TOY" Moulds.  
Write for illustrations of dozens of patterns you can make.

### MAKE-A-TOY COMPANY

Dept. E, 1695 Boston Road, New York City

## OLD MONEY and stamps WANTED



**POST YOURSELF!** It pays! I paid J. D.  
Martin, Virginia, \$200 for a single copper  
cent. Mr. Manning, New York, \$2,500 for one  
silver dollar. Mrs. G. F. Adams \$740 for a few old  
coins. I want all kinds of old coins, medals, bills  
and stamps. I pay big cash premiums.

### WILL PAY \$100 FOR DIME

1891 S. Mint; \$50 for 1913 Liberty Head Nickel  
(not buffalo) and hundreds of other amazing  
prices for coins. Get in touch with me. Send  
4c for Large Illustrated Coin Folder and further  
particulars. It may mean much profit to you.  
Write today to

**NUMISMATIC COMPANY OF TEXAS**

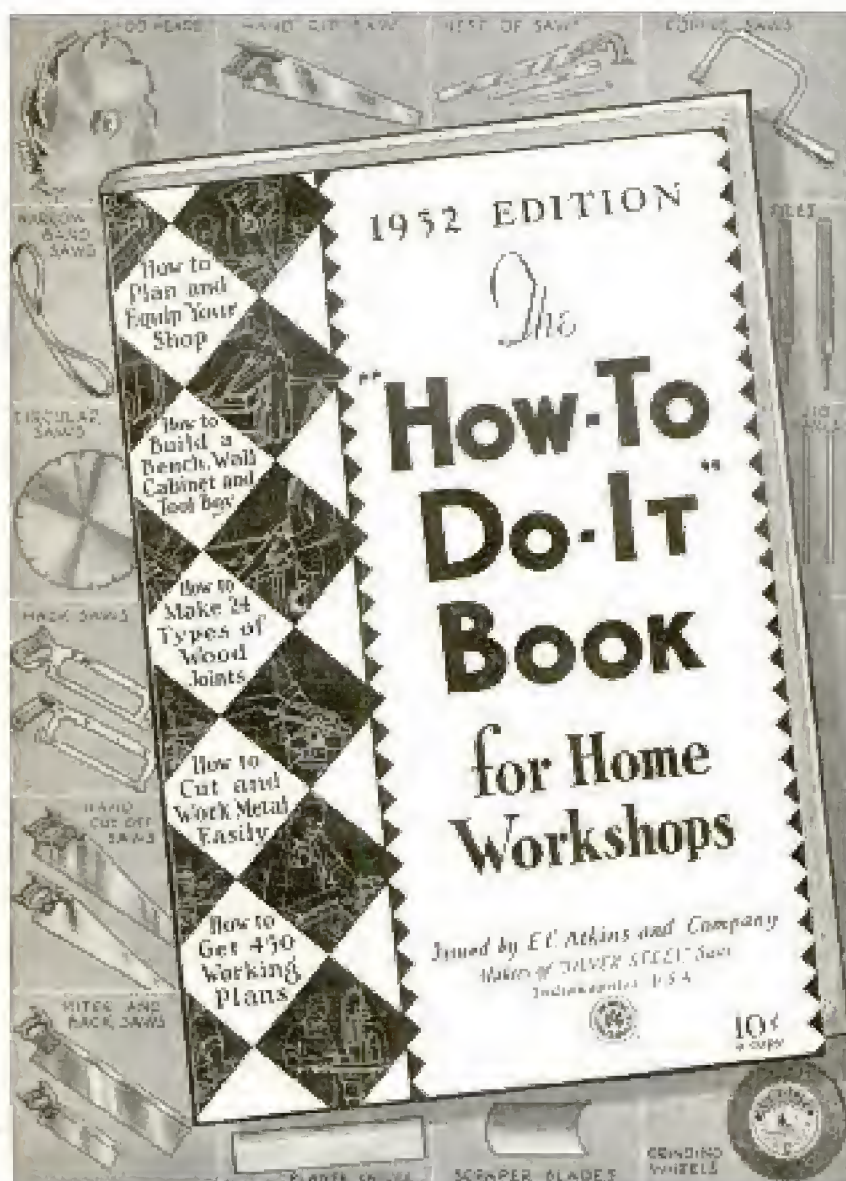
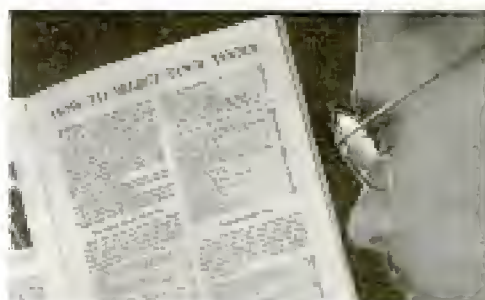
Dept. 374, P.O. Box 100, Fort Worth, Texas

[Largest Rare Coin Establishment in U. S.]



Now, Let's Turn to Pages 6-7  
of This NEW Book, and See

# How to Select..



## Good Tools and Machines for Your Home Shop!

**W**HETHER you want just a small set for home use, or a complete outfit for a workshop, this new ATKINS book will help you select your tools so as to get the utmost value for every dollar you invest.

In chapter three, a veteran craftsman offers you money-saving hints on choosing the best saws, tools and machines, and gives you three lists, with prices.

The first is a modest list of tools for "the handy men around the house." The second is a larger set suitable for a workshop, and the third is a supplementary group for the more ambitious man who does advanced work with wood and metal.

The next page points out the essential features of good bench machines and their cutting accessories, to guide you in getting the right types for your shop.

But this new book does MORE than help you select good tools—it shows you how to DO things with them, easier and better. Read list of contents below. Then send us the coupon for your copy.

If your dealer does not have Atkins book, get it sent to you.



## A 40-Page Guide Book for Home-Craftsmen

This 1932 edition is even larger and better than the first ATKINS handbook for home shops, issued last year. It has 40 pages, size 6 x 9 inches, and covers these subjects:

Home-crafting for Men and Boys—a hobby that pays in pleasure and profit.

How to Lay Out a New Workshop. Showing three typical floor-plans.

How to Select Tools. Money-saving hints on choosing tools and machines.

How to Choose Woods for Shop Work. Data on veneers, plywood, etc.

How to Cut and Fit Wood Joints. Instructions for making 24 types, from simple butt joints to fine dovetails.

How to Equip a New Shop. Building a bench, folding work-table, saw-horse, tool box, wall cabinet, etc.

Newest methods for working metals with hand and power tools—hack saws, circular saws, band saws, etc.

How to Use Grinding Wheels, Files, Where to Get Job Plans. List of 450 things to make of wood or metal.

50 Silver Steel Saws for Home Shops.

## Cut Out Coupon and Mail It Now

**E. C. ATKINS and COMPANY, Est. 1857**  
426 S. Illinois St., Indianapolis, Ind.

I enclose 10¢ for a copy of the ATKINS 1932 Book for Home Workshops.

Name.....  
(Print)

Street.....

City.....

State.....

Dealer.....

When writing to advertisers please mention Popular Mechanics

Copyrighted material



# "BOY... LIONEL TRAINS are just like mine"

*Bob Butterfield, Engineer, 20th Century Limited,  
admiring the new Lionel outfit No. 422 E.*



## Free!

This beautiful 52-page book. Every boy can have a copy. Illustrates in full color Lionel locos, cars, and accessories. Write for yours today.



"My boy, here's a real train. No make-believe about this locomotive. Look how sturdy and strong it is! Watch how swiftly it rolls around the track. Why, it's almost real—life-like . . . just like the good old 20th Century Limited that I drive. Yes, indeed, you're going to learn a lot about railroading when you play with Lionel Trains. They will teach you many things you ought to know, and don't forget Lionel's 'Distant Control'—it's the most marvelous thing in the world. A Lionel is the only train for a boy to have."

It's great fun playing with a Lionel Train—great to know that your train is like real railroad trains. Lionel Trains priced as low as \$5.95. See them demonstrated at your local Department, Toy, Electrical, Hardware, Sporting Goods stores.

**THE LIONEL CORPORATION, Dept. C**  
**15 East 26th Street New York City**

"THE TRAINS THAT RAILROAD MEN BUY FOR THEIR BOYS"

# LIONEL ELECTRIC TRAINS

MODEL RAILROAD ACCESSORIES  
MULTIVOLT TRANSFORMERS



REGISTERED TRADE MARK

# CHEMCRAFT

THE CHEMICAL OUTFIT

## Reveals the Wonders of Modern Chemistry for Your Pleasure!

**Be A Boy Chemist—Work Wonderful Experiments in Your Own Laboratory! Surprise Everybody with Your Chemical Knowledge. Prepare to Lead Your Class in Science and Chemistry! Mystify Friends with Marvelous Chemical Tricks!**

A CHEMCRAFT outfit makes you a Boy Chemist. You can do hundreds of fascinating and useful chemical experiments just like a real chemist! Make your own soaps, ink and paints, dye and bleach cloth; fireproof wood and fabrics; test foods, water and metals; make fire extinguishers and produce endless chemical changes and reactions that will show you the wonders of modern chemical science. You can perform magic chemical tricks, too, original and startling feats that will amaze your friends.

Each CHEMCRAFT outfit contains a large assortment of safe chemicals, all necessary apparatus and a Manual of Instruction. No skill is required; the instructions explain everything. CHEMCRAFT is the original chemistry set; contains more and better experiments, superior chemicals and apparatus. Designed by chemists, recommended by teachers and professors and used in schools and colleges.

## CHEMCRAFT Is Complete Chemistry!

These are the most complete, accurate and scientific chemistry outfits. They teach useful, practical facts. Here are just a few of the many subjects covered: Inorganic Chemistry—Organic Chemistry—Mineralogy—Glass Blowing—Metallurgy—Industrial Chemistry—Food Chemistry—Farms Chemistry—Photographic Chemistry—Electro Chemistry—Household Chemistry

### Eight Wonderful Sets to Select from:

No. 1—\$1.00	No. 3½—\$3.50	No. 8—\$ 8.00	No. 15—\$15.00
No. 2— 2.00	No. 5— 5.00	No. 10—10.00	No. 25—25.00

Nos. 5, 10, 15 and 25 come in handsome wooden cabinets.  
Nos. 1, 3½, 5 and 8 are shown here.

Get CHEMCRAFT for Christmas; these outfits offer more for the money in every way. Look for CHEMCRAFT in any store where toys are sold. Look for the name CHEMCRAFT on the box. If the outfit you want is unavailable in your local store, we will send it, fully prepaid, upon receipt of price.

**The PORTER CHEMICAL COMPANY**  
412 Washington St., Hagerstown, Md.



No. 5—comes in a handsome wooden cabinet and contains 60 chemicals and pieces of apparatus. More than 275 experiments and tricks are explained in the Manual of Instruction. This is a complete chemical laboratory and offers exceptional value. Price \$5.00

No. 8—PORTABLE—a beautiful outfit specially designed for those who want to take their chemistry set to school, to a friend's home, or away on a trip. Comes in strong carrying case with everything arranged neatly in trays. Contains 65 chemicals and pieces of apparatus, and the Manual of Instruction explains more than 440 experiments and tricks. Price \$8.00



No. 1—contains 10 chemicals and pieces of apparatus, with more than 100 experiments explained in the Manual of Instruction. A dandy outfit for the beginner. Price \$1.00



No. 3½—contains 43 different chemicals and pieces of apparatus, and the Manual of Instruction tells how to perform more than 265 experiments and tricks, many of them in advanced chemistry. This outfit offers greater value and a larger and more useful assortment of materials. Price \$3.50

## Try Chemistry for 25c

Get CHEMCRAFT Junior; this set will introduce you to chemistry. You can do lots of experiments and tricks with it. Send for CHEMCRAFT Junior right away, and have some sport!

## Send This Coupon for Free Chemical Surprise

Tell us the name and address of the store near your home which sells toys, and we will send you this Free Chemical Surprise, also full information about CHEMCRAFT. Just fill out this coupon and send it to The PORTER CHEMICAL CO., 412 Washington St., Hagerstown, Md.

Your Name.....

Your Address.....

City.....State.....

Toy Store Name.....

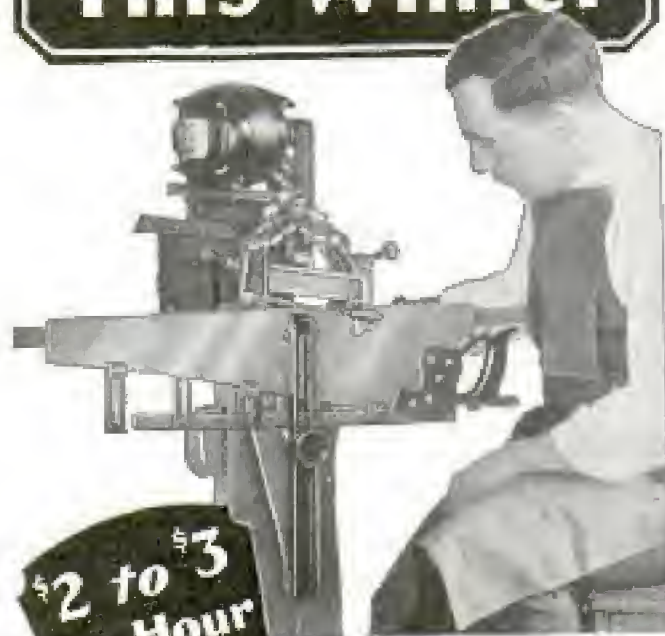
Address.....

When writing to advertisers please mention Popular Mechanics

Copyrighted material



# Extra Money This Winter



**\$2 to \$3  
An Hour  
In Spare  
Time**

## A Fine Paying Cash Business

Build a good, steady, permanent business of your own that will pay you a handsome income all year 'round, filing saws on the Foley Automatic Saw Filer. Very little capital required—buy on easy payments. Make money while starting. Paul J. Davidson, who does spare time filing, writes, "... have made as high as \$12 in one day. ... My business is increasing all the time. Will soon be forced to devote my entire time to saw filing."

### No Experience Necessary

It is easy to file all kinds of saws on the Foley. After saw is put in machine and simple adjustments made, it files *automatically*. E. D. Youlton writes, "Without any previous mechanical experience I operated my Foley, guided by the instructions received with the machine."

### Start Making Money At Once

You will get all the business you can handle just as soon as you let people know you have a Foley Filer. No Canvassing. Others are making big money with the Foley—YOU can too. Send coupon at once for Free Plan.

## Foley Manufacturing Co.

220 Foley Bldg., 11 Main St. N. E.,  
MINNEAPOLIS, MINNESOTA

Please send me complete information about the Foley Filer and Free Plan for getting business.

Name.....

Address.....

City.....State.....

# 100 Shaves from EACH Blade

The Master-Blaze puts a hair-splitting edge on the sharpest safety razor blade—ANY make—in 5 seconds. Many cut 100 shaves per blade. W. F. Wales, Windsor, Ontario, used same blade daily, 3 months. Having given barbers thousands of shaves starts from a single straight edge blade. Only having one put a NEW edge on a safety razor blade. This patented, accurately beveled edge, made of extremely abrasive, makes each 100 blade give 81 to 82 worth of shaves. Also keeps straight edge razor, MONEY REFUNDED 2 not REJECTED.

**YOURS FREE** We will send you a Master-Blaze absolutely free WITH FIRST ORDER of \$2 for 100 of our special L or \$1 for 5, POSTPAID. Or you may send no money and pay postage plus postal charges. But SEND TODAY.

WISCONSIN ABRASIVE CO.  
Dept. 6090

Station A, Milwaukee, Wis.



## Agents

net up to \$10 a day. Mr. May sold 40 at once here. E. Shaw sent sold 1000 one week from window.

## AGENTS! SELLS LIKE WILD FIRE

Get business with water, wash, clothes TO CLEAN AND WASH

WASH RINSE TUBS ONLY TO WASH & RINSE



Blended water YOURS ONLY CLEAN POLISHES WITH 100% LIME

WASH RINSE TUBS ONLY TO WASH & RINSE

WASH RINSE TUBS ONLY TO WASH & RINSE

\$380 monthly selling 10 improved patented Carter Window Washers daily. Cleans, dries, polishes. Eliminates all mess. Good Housekeeping approval. Restricted territory. Write today. CARTER PRODUCTS CORPORATION 998 Front Ave., Cleveland, O.



C. C. FRASER, BOX 14, STA. C, GRAND RAPIDS, MICH.

## I HELP YOU!

Complete Instructions, Patterns, Woods, Parts.

## I ALSO REPAIR!

If your Violin needs fixing, get my Prices.

## MAKE \$100 A WEEK FOR ONLY 25 CENTS DAILY

Take orders for my wonder value all-wool suits, tailored-to-measure. Finely made. New low prices. Bigger commissions than ever, paid daily. Generous bonus to producers. Style creations to please critical men. A big selling, big profit line. No experience needed. Write now for FREE outfit of large watch samples. You are under no obligation. W. Z. GIBSON, Inc., Dept. B-111, 500 Throop St., Chicago, Ill.

## AGENTS 500% PROFIT GENUINE GOLD LEAF LETTERS

guaranteed to never tarnish. Anyone can put them on stores and office windows. Immense demand, large profits. Paul Clark says: Smallest day \$28.70. R. L. Reel made \$820 in two months. Write today for free sample and liberal offer to general agents. METALLIC LETTER CO. 433-B N. Clark St., CHICAGO

Big 3 ft. Telescope Five Sections, Brass bound, Powerful Lenses, 11-Miles range. Special Eye Piece for looking at the Sun, included FREE. Can be used as a Microscope. Guaranteed. Big value. Postpaid. \$1.75. C. O. D. 15c extra. Banner & Company, 1-43, Trenton, N.J.

### Build a CLOCK for Pleasure or Profit!

**FREE BOOK** of Clock Making, Money Making ideas. Give details, price of materials, parts. Write NOW for cost!

**Shows How YOU Can Make Fine Clocks Right at Home**

—for yourself, or to sell at Big Profits. We furnish instructions, parts. Yours \$2.25 and sheets with clock, all parts. Make your own clock parts. Cash in on demand for Mantel, Table, Grandfather Clocks. Ask about new low-priced Electric Clock and Special Blue Print Offer. FREE Catalog.

AMERICAN CHIME CLOCK COMPANY  
1670-T Ruffner St. Philadelphia, Pa.





# SPLIT THE AIR *Like a Rocket!*

**F**LASHING acceleration — from start to full speed in a few seconds — is a motorcycle thrill that only a "rocket motor" could equal.

Just ride a 1932 Harley-Davidson and feel what real pick-up is. See how it shoots you away from tangled traffic. You are down the road, safe and clear, before cars are really rolling. Then the whole countryside is yours — for swift jaunt or long tour. And motorcycling costs so little!

Look over the 1932 Harley-Davidsons at your nearest dealer's. See for yourself how little they cost — at the new reduced prices — and what a convenient Pay-As-You-Ride Plan he has.

\*195—at the factory—is the low price of the Harley-Davidson Single, a new model for 1932. It's a completely equipped motorcycle, with 3-speed transmission, full electric equipment and all. Wonderful value.

Ride a  
**HARLEY-DAVIDSON**

## MAIL THIS COUPON

Harley-Davidson Motor Company  
Dept. P., Milwaukee, Wis.  
Interested in your motorcycles. Send Literature.

Name .....

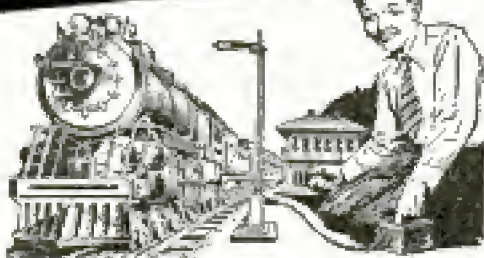
Address .....

My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31  
years and up, ☐ under 16 years.  
Check your age group.

When writing to advertisers please mention Popular Mechanics

Copyrighted material



**BOYS TRAIN BOOK FREE**

**Greatest Values**
**Most Fun Features • COMPARE**
**American Flyer Trains**

Write today for the colored catalog and see the big new steam and electric type trains that *outpull all others*—New trains as low as \$5.50. Fun making automatic signals, Stations, Bridges, Tunnels, etc.

Get the catalog and *compare*—American Flyers cost less, yet lead in fun making features, speed, size, realism and number of pieces included. You want the best, only an American Flyer will do.

DADS, too, make  
railroading a hobby

American Flyer Mfg. Co.,  
2248 S. Halsted St., Chicago.  
Send Free Train Book.

Name.....  
Address.....

**American Flyer Trains**
**MOVIES In Your Home**


Our marvelous, practical Movie Machines sell as low as \$5.00 postpaid. Also finest 16 mm. cameras and projectors at factory prices. A complete line of both standard and 16 mm. film available at low prices with exchange service.

Write for big, FREE catalogue.

**PARAMOUNT MFG. CO.**

Dept. C-46  
Boston, Mass.

**FREE 6 FAMOUS SPARK PLUGS**  
worth \$4.50  
To customers for GOOD YEAR  
Goodrich - Firestone and other tires

DEALERS WANTED

**Lowest Prices in History - 75% Saving**

Midland's Immense Buying Power Makes This Possible  
Thousands of motorists all over U. S. A. use and love our Standard Brand reconstructed Tires. Hard service on roughest roads guaranteed. Our nation-wide success and reputation speaks for itself. **FREE** for limited time one 75c best quality spark plug with every tire shipped. Order 4 tires—get full set 6 spark plugs free. New gap for your car—no extra cost. Be sure to mention make of car, model, year built. **ORDER TODAY** at these Rock Bottom Prices. Satisfaction Guaranteed.

**BALLOON TIRES**

Size	Run Tires	Tubeless	Reg. Cord Tires	Size	Run Tires	Tubeless
28x4-40-21"	\$2.30	\$1.85	32x6-40-21"	\$3.20	\$1.40	\$1.40
30x4-40-21"	2.40	1.95	32x6-38-21"	3.20	1.40	1.40
32x4-40-21"	2.45	1.95	32x6-36-21"	3.20	1.40	1.40
34x4-40-21"	2.50	1.95	32x6-34-21"	3.20	1.40	1.40
36x4-40-21"	2.55	1.95	32x6-32-21"	3.20	1.40	1.40
38x4-40-21"	2.55	1.95	32x6-30-21"	3.20	1.40	1.40
40x4-40-21"	2.55	1.95	32x6-28-21"	3.20	1.40	1.40
42x4-40-21"	2.55	1.95	32x6-26-21"	3.20	1.40	1.40
44x4-40-21"	2.55	1.95	32x6-24-21"	3.20	1.40	1.40
46x4-40-21"	2.55	1.95	32x6-22-21"	3.20	1.40	1.40
48x4-40-21"	2.55	1.95	32x6-20-21"	3.20	1.40	1.40
50x4-40-21"	2.55	1.95	32x6-18-21"	3.20	1.40	1.40
52x4-40-21"	2.55	1.95	32x6-16-21"	3.20	1.40	1.40
54x4-40-21"	2.55	1.95	32x6-14-21"	3.20	1.40	1.40
56x4-40-21"	2.55	1.95	32x6-12-21"	3.20	1.40	1.40
58x4-40-21"	2.55	1.95	32x6-10-21"	3.20	1.40	1.40
60x4-40-21"	2.55	1.95	32x6-8-21"	3.20	1.40	1.40
62x4-40-21"	2.55	1.95	32x6-6-21"	3.20	1.40	1.40
64x4-40-21"	2.55	1.95	32x6-4-21"	3.20	1.40	1.40
66x4-40-21"	2.55	1.95	32x6-2-21"	3.20	1.40	1.40

**12 MONTHS SERVICE**  
Guaranteed on all tires  
All Tubes New  
Guaranteed First Quality

Send \$1.00 deposit with each tire ordered.

Balance C.O.D. If you send cash in full deduct 5 per cent. You are guaranteed a year's service or replacement at half price. **Order Today—Save Money.**

**MIDLAND TIRE AND RUBBER COMPANY**

Dept. 665 1000-10 W. Sixty-Third Street Chicago

**MOTORCYCLES**

Pay As Low As \$2.00 per Week  
Hendersons, Harley-Davidsons, Indians  
Slightly used and rebuilt. Hundreds to select from. Send 10c for list today.

MYEROW BROS. CO., 15 Berkeley St., Boston, Mass., U. S. A.

Cal. 30-40 Sm. S&W

**KRAG CARBINE** Price \$9.75

All the qualities of a high price rifle. In best used condition, all working parts guaranteed for one year. Send today for our Free 48-page illustrated catalog of money saving values! Guns, Ammunition, Cutlery, Sports and Gun's goods.

Deposit required on all orders. Money refunded if not satisfactory.

W. Stokes Kirk, Dept. P. M.-12, 1627 N. 10th St., Phila., Pa.

**DEAFNESS IS MISERY**


Many people with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor, himself deaf.



A. O. LEONARD, Inc., Suite 699, 70 5th Ave., New York

**Now! Do Your Own Electric Nickel Plating**

COMPLETE  
INTRODUCTORY  
OUTFIT ONLY  
**\$6.50**

Plate with  
Nickel, Brass,  
Copper, Silver,  
Gold, etc.

**A REAL MONEY-MAKING OPPORTUNITY**

NO EXPERIENCE REQUIRED. Do YOUR OWN Electric Plating in Your Home, Garage, Office, or Place of Business. Electrically Deposit Metal—Nickel, Brass, Copper, Silver, or Gold. You can successfully do all the plating on your Automobile, Electric Fixtures, Faucets, Spoons, Forks, Chandeliers, Tools, Coffee Urns, Surgical and Dental Instruments, Utensils, large or small, Iron Stoves, Music Instruments, recondition worn plating or plate New Work; do it instantly without interrupting the Service or without removing the parts to be plated with the

**ALADDIN PORTABLE ELECTRO-PLATER**

Simple and Economical to operate. Not a toy, but a practical Plating Outfit with which Perfect and Durable Work can be done. Positively Guaranteed to do as we claim. **BE YOUR OWN BOSS!** Build up a Profitable Aladdin Electric-Plating Business of your Own. This offers wonderful **ECONOMY** to users and **BIG MONEY-MAKING** possibilities to AGENTS. Thousands in Service since 1924. Write today for **FREE PARTICULARS AND TESTIMONIALS**.

P. J. F. BATENBURG CO. Dept. 255 RACINE, WISCONSIN

—AGENTS—  
WANTED EVERYWHERE



# Two Tools *in* One!

**A New Motor-Driven Tool that Achieves  
Amazing Results**



## Delta Quality Motor-Driven Woodworking Tools

Save you time, money, and labor. They take all the drudgery out of woodworking—enable you to turn out better work in a fraction of hand time. Quickly pay for themselves. Used and recommended by thousands of home workshop owners, carpenters, contractors, farmers, and factories.



### New Delta DRILL PRESS

Large capacity. Ball-bearing spindle. Automatic leveling, accurate tilting table. Many special features. Unusual value.



### New Delta BAND SAW

Smooth running, efficient, safe. Ball-bearings throughout—including the blade guide. Fully guarded in every way. Graduated tilting table. Surprisingly low priced.



### COMBINATION UNIT

Circular Saw, Jointer, Mortiser, all mounted on convenient, portable stand. Each tool can be operated separately or all together. No interference.

### COMPLETE WORKSHOPS

All mounted on bench or convenient stands . . . available in large variety of combinations, and at prices to fit all needs.



Complete DELTA 1932 Line also includes: Woodturning Lathes, Jointers, Circular Saws, Moulding Cutters and many new accessories.

## A SCROLL SAW with Band Saw Efficiency

THIS new, moderately-priced tool is *radically different* from any scroll saw on the market. Runs at full motor speed—1800 strokes per minute—with all springing and twisting eliminated, with perfect balance and absence of vibration! As a result, this remarkable tool produces fine, smooth and accurate work hitherto only possible on a hand saw. Has 24-inch throat capacity and it will saw wood 2 inches thick! Works on metal and fibre as well as wood. Has numerous special features. Can be used for filing, sanding, and honing. Send the coupon below for FREE! Learning telling all about this amazing new tool!

### Delta Quality Pays in the End

Fine quality workmanship and materials are used throughout in Delta Motor-Driven Tools—even where they cannot be seen. That's why woodworkers the country over say: "Delta offers the most machine value per dollar."

### 10-Day Trial Easy Terms

Delta Tools are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer and also of convenient Easy Payment Plans on larger outfits, send the coupon below TODAY!

### CATALOG FREE!

Send today for this Big Illustrated Book crowded with valuable information for the woodworker—professional, spare-time hobbyist. Shows the complete 1932 line of Delta Motor-Driven Tools. Send the coupon NOW!

**DELTA SPECIALTY CO.**  
(Div. of Delta Mfg. Co.)  
3775 N. Holton Street  
Dept. A1231 Milwaukee, Wis.

**DELTA SPECIALTY COMPANY**  
(Division of Delta Mfg. Co.)  
3775 N. Holton Street, Dept. A1231  
Milwaukee, Wisconsin

Please send me, without obligation, 1932 Delta Catalog. Also send full details of your 10-Day Trial Offer and Easy Payment Plans.

Name.....  
Address.....  
City.....State.....

When writing to advertisers please mention *Popular Mechanics*



# FREE! Our Christmas Gift to YOU

With Each Purchase as Explained in Our SPECIAL OFFER, now Ready to mail YOU—Write for Your Copy at Once!

OFFER EXPIRES DEC. 25<sup>TH</sup>

Your Choice

**DIAMOND RING  
ELECTRIC CLOCK  
TRAY OF SILVER  
26 Pieces ~ Free!**

**Most Sensational Offer**

**Ever-Made in America,  
Lowest Prices ~ Lowest  
Terms and in Addition  
a Valuable Gift FREE!**

To celebrate our 37th year in the Watch and Diamond Business, with a daringness which amazes, we make the most remarkable offer we have ever proposed. In addition to giving you wonderful opportunities to buy jewelry at such splendid values and on credit, we give you absolutely FREE your choice of the FREE gifts listed above.

**We Sell Nationally Advertised Watches, Diamonds and Silverware on payments at advertised cash prices.**

Think of it. We offer you watches, diamonds, and silverware on credit at nationally advertised cash prices. Now there remains no reason why you should not enjoy a diamond, watch, or any other article of jewelry while you pay for it.

**\$3.50 a Month makes it easy for you to own a Valuable Watch or Diamond**

Every joy of the ownership and wearing of fine jewelry may be yours for as little as \$3.50 a month. We have removed every obstacle from the path of ownership of fine diamonds and watches. Take advantage of this offer before it is withdrawn.

Write for Catalogue and Beautiful Circular Illustrating Free Gifts

**SANTA FE WATCH COMPANY**  
Dept. C-6, Thomas Bldg. Topeka, Kansas

**SANTA FE WATCH CO.,**  
Dept. C-6, Thomas Bldg., Topeka, Kansas.

Please read me the catalog I have checked.

- Railroad and Express Pocket Watches..... ☐  
Ladies' and Men's Wrist Watches..... ☐  
Ladies' and Men's Diamond Rings..... ☐  
Christmas Circulars Illustrating Free Gifts..... ☐

NAME.....

ADDRESS.....

# Rupture CONTROLLED New Safe Way!

**Never Before Such Comfort!**

**N**OW comes the latest scientific development—the new Kellogg Uplift Hernia Belt—to provide control for rupture with safety and comfort. New principle holds weight of abdominal contents up away from rupture. Special chamois pad controls the actual opening. Permits freedom of stride and bending. No chafing or binding. No rubber to irritate. Natural even control. Gives relief from backache and fatigue.



**FREE LITERATURE**

Find out how far superior to ordinary appliances the new Kellogg method is. Free illustrated literature sent without obligation. Also full line of health belts for every requirement. Write today! Kellogg Belt Co., Dept. W-160, Jackson, Mich.

## A Useful Gift for Your Boy!



Give your boy a chance to put his spare time to good use with a home work shop equipped with Parks woodworkers.

The Parks Wood-Working Machine Co. Dept.

**PARKS**  
WOODWORKING MACHINES

Send 1000 for descriptive circular

PM-12, 1530 Knowlton St.

Cincinnati, Ohio

Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

# QUIT TOBACCO



No man or woman can escape the harmful effects of tobacco. Don't try to banish unaided the habit tobacco has upon you. Join the thousands of inveterate tobacco users that have found it easy to quit with the aid of the Keeley Treatment.

**KEELEY** Treatment For Tobacco Habit Successful For Over 50 Years

Quickly banishes all craving for tobacco. Write today for Free Book telling how to quickly Free yourself from the tobacco habit and our Money Back Guarantee.

None of the famous Keeley Treatment for Liquor and Drugs. Booklet sent on Request. Correspondence Strictly Confidential.

THE KEELEY INSTITUTE, Dept. A-952, Dwight, Illinois

When writing to advertisers please mention Popular Mechanics

Copyrighted material



# WITTE LOG SAWS

# \$33

## BRINGS ONE TO YOU

## BE YOUR OWN BOSS



### USE ENGINE 365 DAYS A YEAR

The human arm swing saw, cuts 15 to 40 cords a day on 2 gallons of gas. When not sawing wood use the engine for other money making jobs.

Don't wait for something to "turn up", go into business for yourself. People all around you need wood to burn this winter. Be the wood contractor in your neighborhood.

### MAKE BIG MONEY

Lots of timber waiting to be turned into cash. Use the finest Log and Tree Saw on earth. Easy terms on balance.

J. D. Stevens writes, "I am selling all the wood I can cut—it's a big money maker." (Address on request.) You, too, can be independent and run your own business.

Buy Direct From Factory

Since 1870

1932 Models at 1914 Prices

210X Carson St.  
PITTSBURGH, PA.

**WITTE  
ENGINE WORKS**

6749 Oakland Ave.  
KANSAS CITY, MO.

## RADIO BUILDERS

We carry a complete line of radio parts for all Popular Mechanics circuits and replacement parts for all sets.

Send Us Your Order

**NEWARK ELECTRIC CO.**

228 W. Madison St.

CHICAGO, ILL.



See Miles Away! Distant people and objects seem close. Over 3 ft. long, brass bound. Made in Europe. 1932. of fun. Thousands pleased.

**Send No Money!** On arrival pay Postman special price, only \$1.75, plus postage. Two for \$3.25. (Or send price and we pay postage.) Satisfaction guaranteed or money back. Send today.

**FREE With Order** Strong leatherette Carrying Case and Solar Eye Piece to view the sun.

Bargain House, 427 Randolph St., Dept. 16, Chicago

## AGENTS \$6 A DAY



Wonderful chance to make \$6 a day taking orders for No-Frost—the amazing new preparation that keeps rain, snow, frost, mist and steam off auto windshields, show windows, mirrors, etc. A sensation everywhere. No hunting for prospects. Auto owners, bus drivers, store-keepers, housewives buy on sight. Big profits. Steady repeat business.

### \$50 Profit in 4 Days

That's what Andressen made taking orders for our specialties. Mrs. Hart cleared \$17 the first afternoon. This shows the remarkable possibilities. No capital or experience needed. We furnish everything. Earnings start at once. Wonderful opportunity for men and women everywhere. Write quick for Profit-Sharing Offer.

**ZANOL PRODUCTS CO.**

8241 Monmouth Ave., Cincinnati, Ohio



## Hotter than Coal and no dirt



A New Invention

No away forget with the drudgery of wood or coal. The most simple and economical invention on the market is now giving perfect satisfaction to enthusiastic users everywhere.



**Burns 96% Air—4% Cheap Oil**  
The International Oil Burner fits in the fire box of any range, stove or furnace. Installed in a few minutes. No noisy motor or complicated parts.



**Costs Only a Few Dollars**  
Heats just as well as a \$400 or \$500 oil burner without electricity or gas. Simply turn one valve and you have all the heat you want. Cleaner and better for heating and cooking. Approved by National Underwriters' Laboratories and engineers everywhere. Over 150,000 in use.



### 30 Days FREE Trial Offer

Try this wonderful burner right in your own home at our risk. Act quickly and get our special low introductory price. Sold under absolute money-back guarantee. Write at once for free booklet on home heating and free burner offer.



### Agents-Dealers-Distributors

Our FREE burner offer starts you in business. Big money to be made. The demand is enormous. We also want spare or full time workers immediately. If \$500 a month and more interests you, write or wire us for our protected territory offer.

-----Clip This Coupon-----

**INTERNATIONAL OIL HEATING CO.**

3500-10 Park Ave., St. Louis, Mo., Dept. 405-D

Send your free booklet and free details on home heating for stove ☐ furnace ☐ Also free burner offer.

Name.....

Address.....

☐ Check if interested in making money as an International representative with protected territory.

When writing please mention Popular Mechanics



# PATENT

## Protect Your Ideas

### Take the First Step Today

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon on the opposite page.

### Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trade mark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trademark owners located in every state in the Union.

### NO CHARGE for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will also send you my "Record of Invention" form on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.



My Offices  
Just Across  
Street From  
U.S. Pat. Office



Above is a view of my drafting and specification offices where a large staff of experienced experts is in my constant employ. All drawings and specifications are prepared in my offices.

# NEWS

## Inventors Write for these Free Books

### Strict Secrecy Preserved

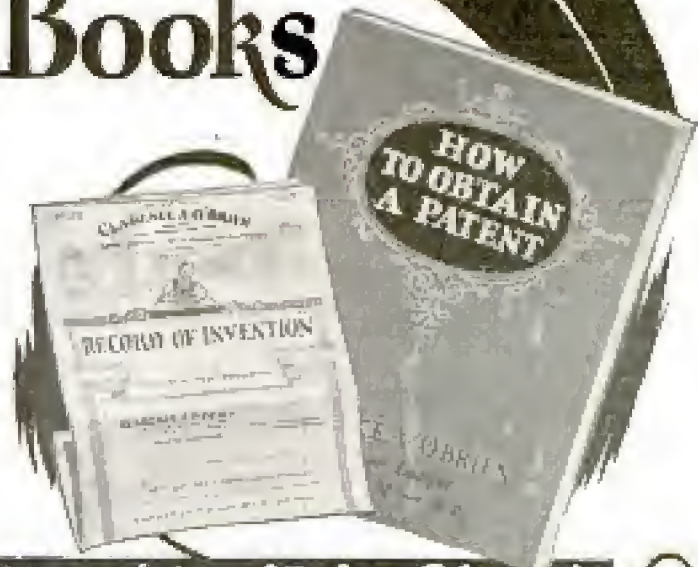
All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But **FIRST**—clip the coupon and get my free book. Do **THAT** right now.

## Clarence A. O'Brien

*Registered Patent Attorney*

Member of the Bar of: The Supreme Court of the United States, U. S. Court of Customs and Patent Appeals, U. S. Court of Claims, Court of Appeals, District of Columbia and Supreme Court of the District of Columbia.

Practice confined exclusively to Patents, Trademarks and Copyrights



**Clip this Coupon and Mail it Now!**

**CLARENCE A. O'BRIEN, Registered Patent Attorney**  
70-R Security Savings and Commercial Bank Bldg.  
Washington, D. C.

(Or, Suite 1106, Dept. A-18, Woolworth Bldg., New York City)

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name.....

Address.....

(Important—Write or print name plainly and address office nearest you)

*When writing to advertisers please mention Popular Mechanics*



# PATENTS SECURED TRADE-MARKS REGISTERED

High-class professional service for Inventors and Trade-Mark Users is necessary for PROPER PROTECTION. We Offer you our facilities on Reasonable Terms. If you have an invention send us a model or sketch and description and we will give you our OPINION whether your invention comes within the provisions of the Patent Laws. Our book, "HOW TO GET YOUR PATENT" and Record of Invention Certificate sent on request. **DELAYS are DANGEROUS** in Patent Matters.

Terms Reasonable.

Best References.

WRITE TODAY

**RANDOLPH & COMPANY, Patent Attorneys**

301 VICTOR BUILDING, WASHINGTON, D. C.

Name.....

Address.....

## PATENTS

### PROTECT YOUR IDEAS

Write today for FREE BOOKLET, HOW TO OBTAIN A PATENT and RECORD OF INVENTION—or send Drawing or Model of your Invention for Examination.

Promptness Assured with Best Results

**MILLER & MILLER**  
REGISTERED PATENT ATTORNEYS

Former Members Examining Corps U. S. Patent Office  
Dept. A-1006 Woolworth Bldg. New York  
672 Earle Building Washington, D. C.

## PATENTS—TRADE MARKS

All cases submitted given personal attention by members of the firm. Information and booklet free. Patent Office & Federal Court Practice.

**LANCASTER, ALLWINE & ROMMEL**  
PATENT LAW OFFICES  
480 Ouray Bldg. Washington, D. C.

## PATENTS

### TO THE MAN WITH AN IDEA

Preliminary advice gladly furnished without charge. Booklet of information and form for disclosing idea free on request.

**IRVING L. McCATHRAN, Patent Lawyer**

Formerly with and successor to RICHARD B. OWEN  
750 International Bldg. Washington, D. C.  
41-E Park Row New York City

TRADE-MARKS

## PATENTS

Trade Marks, Copyrights, Patent Litigation Handbook with Illustrations, 100 mechanical movements. Sent free on request.

**ALBERT E. DIETERICH**

Successor to Fred G. Dieterich & Co.

formerly member Examining Corps U. S. Patent Office

REGISTERED

**PATENT LAWYER and SOLICITOR**

621-A, Ouray Bldg.

30 Years' Experience Washington, D. C.

## INVENTORS

who derive largest profits know and heed certain simple but vital facts before applying for Patents.

Our book *Patent-Sense* gives these facts; sent free. Write LACEY & LACEY, 635 F Street N. W., Dept. 5, Washington, D. C. Estab. 1869.



## GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special orders of any kind. Send us your blue prints and inquiries.

Write for Catalog No. 10

**CHICAGO GEAR WORKS**

793-773 W. Jackson Blvd., CHICAGO, ILL.



## BOW LEGS?

THIS GARTER (Pat'd)

Makes Trousers Hang Straight

If Legs Bend In or Out

Free Booklet—Plain Sealed Envelope

**THE T. GARTER CO., Dept. E**  
South Bend, Ind.



## BUCHSTEIN'S FIBRE LIMB

Is suitable to your stump—accompanying cast, light. Easy adjustment. Grace for all deformities.

Send for Catalog Today

D. BUCHSTEIN CO.  
610 3rd Ave., So.  
MINNEAPOLIS, MINN.

## PATENTS

Booklet Free Highest References  
Promptness Assured Best Results

Send drawing or model.

### ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Bank-Recommended Attorneys, published by Rand-McNally & Co., Chicago, Ill.; The Baggott & Ryall Directory of Guaranteed Attorneys, published by Legal Directory Corporation, Boston, Mass.; Flugel's Law List, published by Legal Directory Publishing Co., St. Louis, Mo.; American Lawyers Annual, published in Cleveland, Ohio; Bankers Service Legal Directory, published by Bankers Service Co., Boston, Mass.; Eyre's Law List, 9 Park Place, New York City; Walters Legal Directory, Omaha, Nebraska, and the National Directory of Attorneys, Baltimore, Maryland.

**WATSON E. COLEMAN,**  
REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.  
**WASHINGTON, D. C.**



# Send for **FREE BOOK** "How to Obtain a **PATENT**"

Delays may cost you thousands in profits from your invention. "Little ideas may have big commercial possibilities,"—protect them by Patents.

Our new **FREE BOOK**, "How to Obtain a Patent," gives you complete information on how to obtain the exclusive right to your invention and to the profits that may arise from it.

The advisability of immediately applying for a patent on your invention is obvious. Frequently men in widely separated parts of the country work on the same idea at the same time. The first to get his application on file has many advantages over the other party.

*We'll send you a "Record of Invention" blank **FREE***

The first step to take is to secure one of our Record of Invention blanks (for which there is no charge), make a sketch of your invention on it, and have it filled in, dated and witnessed. It can then be used as proof of conception, when necessary. By following the instructions on the blank you may be saved much trouble and expense in securing a patent on your invention.

*Established 1898*

For over 33 years our staff of experienced attorneys has been serving inventors before the Patent Office and the federal courts. This long record of service, plus the testimonials of thousands of inventors, assures you the kind of patent service you desire.

*Strictest Secrecy Preserved*

Our offices in various cities are ready to give you personal service. Our Washington office, in close proximity to the Patent Office, does much to hasten the preparation and prosecution of patent applications. Send for the Free Book and the Record of Invention blank **NOW**. As soon as we receive the Record of Invention, one of our attorneys, selected for his knowledge along certain lines of patent work, will take charge of your case. Mail the coupon now—show "diligence" in getting your application on file—it may mean much to you later on.

## MAIL COUPON NOW

### VICTOR J. EVANS & CO.

Registered Patent Attorneys

New York Office  
223 Broadway

Chicago Office

Philadelphia Office

Pittsburgh Office

111 W. Washington St.

133 S. Broad St.

501 Liberty Ave.

San Francisco Office, 382 Market St.

Los Angeles Office, 510 S. Spring St.

MAIN OFFICE: 600L Victor Bldg., Washington, D. C.

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" blank at once.

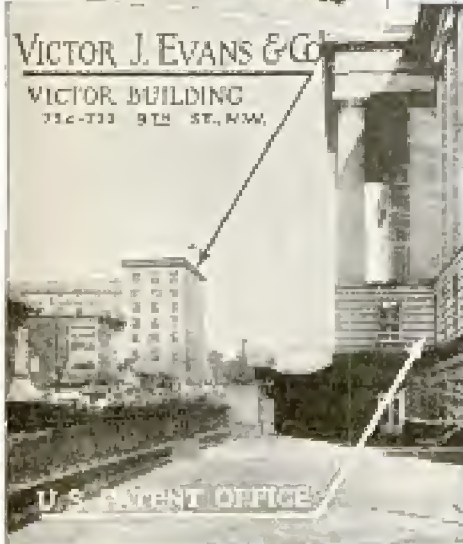
Name

Street & No.

City  State

When writing to advertisers please mention Popular Mechanics

Copyrighted material





**YOUR CHOICE** Sent for \$1.00  
10 MONTHS TO PAY

We announce lowest prices in years on genuine blue-white diamonds and standard watches.

**10 DAYS' FREE TRIAL**  
Send only \$1 with order and your choice comes to you on 10 days' free trial—no C. O. D. to pay on arrival. No interest—no red tape. After full examination take 10 months to pay balance. Satisfaction guaranteed or money back. Written gold bond guarantee with every purchase.

All transactions Confidential.



FM 57... "Princess Una"—square grooved 18-K Solid White Gold ring; very genuine blue-white diamond in center; 2 diamonds on sides. \$48.50



FM 34 "Madame"—slightly engraved 18-K Solid White Gold salt-faire ring; very genuine blue-white diamond \$25



FM 50 "Martha Washington"—set with 2 diamonds and 8 synthetic sapphires or emeralds; engraved 14-K Solid White Gold case; guaranteed 16-jewel movement. Engraved open-link bracelet. \$37.50



FM 6 "Nationally advertised; fully guaranteed 13-jewel Heuleva watch. White sturdy case, "dial-tite" protector; radium dial and hands; latest style open-link bracelet. \$29.75

Send for copy of latest catalogue showing special values in genuine blue-white diamonds from \$25 to \$1,000, and standard watches from \$12.50 up.

**ROYAL DIAMOND & WATCH CO.**  
ADDRESS DEPT. 31-K  
170 BROADWAY, NEW YORK

Send for New Catalogue

## AUTO AND TRUCK OWNERS

Install a Re-Bo Self-Stopper and protect your battery and ignition system from damage if switch is left on. Easily installed on any car. Only \$2.00 post-paid in U. S. Agents wanted.

RE-BO PRODUCTS COMPANY, 6 Vernal Street, Somerville, Mass.

## ELECTRIFY YOUR OLD CLOCK

do this at home with  
Amazing New Invention

Write for **FREE TRIAL Offer**

Write today for details of **FREE TRIAL Offer** and our free literature telling all about this wonderful new invention that now enables you—or anyone—to easily and quickly turn that beautiful old clock you prize so highly—into an old clock—into a guaranteed electric clock at low cost.

### Unconditionally GUARANTEED

With our simple easy instructions, anyone can install this amazing invention **AT HOME**. No electrical experience or special ability needed to make ANY old clock give accurate **NAVAL OBSERVATORY TIME** all the time with no more winding, no noise and no repairs.

### SPECIAL INTRODUCTORY PRICE

Special low price now...also special User Agent's proposition. Every home an easy sale. Good profit margin...\$4.00 a day—more in spare time—no over income. Write for complete details—before special offer closes.

ROBERT BARCLAY, Inc., 849 W. Washington Blvd., Dept. 13-59, Chicago

**AGENTS**  
earn  
\$4.00 a day  
Spare Time

Write for  
Free Literature

When writing to advertisers please mention Popular Mechanics

## LAME BACK? LUMBAGO?

End Pain—Sleep Soundly!



FATHER: I'll never be able to sleep tonight with this pain in my back.

MOTHER: Here, pat on Sloan's Liniment. It eases backache for me in 5 minutes.

Don't let lame back or lumbago keep you awake again. Sloan's Liniment relieves pain almost instantly. No rubbing needed—just pat it on. Sloan's warms like sunshine, bringing fresh blood to the sore spot. The pain disappears and you sleep soundly. Get a fresh bottle today at your druggist's. Only 35¢.

## SLOAN'S Liniment



Warms Like  
Sunshine



## How to Obtain A Better Looking Nose

Improve your personal appearance  
My free book tells you how I guarantee to improve the shape of your nose by remodeling the cartilage and fleshy parts, quickly, safely, and painlessly, or refund your money. The very fine, precise adjustments which only my new patented Model 23 Nose Shaper possesses, make results satisfactory and lasting. Worn night or day. Over 100,000 users. Send for free book to  
**M. TRILETY, Pioneer Nose Shaping Specialist**  
Dept. 208  
BINGHAMTON, N. Y.

Information on any book free. Write Popular Mechanics Press, Chicago, Ill.

## NOW YOU CAN HAVE A NEW SKIN IN 3 DAYS' TIME!

VISIBLE UGLY BLEMISHES DISAPPEAR!



### GET THIS FREE

—and learn that what was considered impossible before—the removal of pimples, blackheads, freckles, tan, oily skin, large pores, wrinkles and other defects in the outer skin—can now be done harmlessly and economically at home in three days' time in many instances as stated by legions of men and women, young and old. It is all explained in a new treatise entitled

### "BEAUTIFUL NEW SKIN IN 3 DAYS."

which is being mailed absolutely free to readers of this magazine. So, worry no more over your humiliating skin and complexion or signs of aging if your outer skin looks soiled and worn. Simply send your name and address to **MARVO BEAUTY LABORATORIES**, Dept. 407A, No. 1300 Broadway, New York, N. Y., and you will receive it by return mail in plain wrapper, postpaid and absolutely free. If pleased, tell your friends about it.



# ENGINES

Enclosed,  
Self Oiling, Roller Bearing

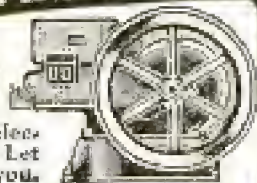
The sensation of the year, something new. Runs smooth as an electric motor. Low operating cost. Let this engine make money for you.

Big Illustrated Catalog Free.

ALL LIQUID FUELS

**WITTE ENGINE WORKS**

1749 OAKLAND AVE. KANSAS CITY, MO.



**The Practical Gift**  
**A Gerstner Tool Chest**  
at Christmas time or on other occasions, is an appreciated gift. Free Catalog shows many sizes and styles.

*Gerstner Sons*

435 Columbia St. Dayton, Ohio

## BURN YOUR NAME ON TOOLS

WITH THE  
**ARKOGRAF**

PROTECT YOUR TOOLS FROM THEFT

Write with electricity your name or design on the handle and foot of tools and instruments, or on metal, like writing on paper with pen or pencil.

Complete Outfit \$3.50—Pencil Arkografs. Interesting illustrated circular free. Write today. Agents wanted.

ARKOGRAF PEN CO., 1111 E. Stark St., Portland, Oregon



## A. C. Electric Plants



ONAN A. C. PLANTS furnish the same current as city service—110 volt, 60 cycle, A. C. Operate Radios, Water Systems, Refrigerators, all Household Appliances.

Sizes 500 to 1800 Watts

Available from stock. No battery used except to start the engine. Ideal for farms, camps and lake homes.

Also a complete line of D. C. Models.

D. W. ONAN & SONS

32 Royallan Ave. Minneapolis, Minn.

## New Tractors from Old Fords

Do All Farm Work!

Easy to Build—

We put you here

Make powerful tractor out of your Model "T" or "A" Ford or Coupelet with SHAW Tractor Equipment. Low cost! New HIGH ARCH Model with 30 inch clearance shreds 1 or 2 rows of corn and other crops. Cultivates, plows, weeds, discs, etc. Runs both machinery. Easy to attach. SPECIAL LOW INDUCTORY PRICES! Write for FREE literature.

SHAW MFG. CO., 4812 Center St., GALESBURG, ILL.



## FREE TOOL BOOK

The entirely new Disston Saw, Tool and File Manual tells how to choose, use, and care for tools, file and set saws, etc. Sent free.

Henry Disston & Sons, Inc., Dept. M, Philadelphia. Canadian Factory, Toronto

## Brown & Sharpe Tools

"World's Standard of Accuracy"



Send for Catalog No. 31 describing 2300 Precision Tools. Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

## ONE-MAN SAW MILL

Makes lumber, shingles, cross ties, fence posts, laths, fruit and vegetable crates and boxes, dimension blanks for furniture, etc. Splits blocks into firewood. Suggested by farmers, lumbermen, contractors.



**\$39**  
BRINGS IT TO YOU

in a week, or on one job. Guaranteed. Sold direct from factory. Write today for prices in offer and Free Book "How To Make Lumber".  
BELSAW MACHINERY CO.  
Rochester, N. Y. 14609, Kansas City, Mo.



**O**R do you want the type of lathe that compares favorably with the modern accurate and fast-producing heavy duty lathes in the industrial field?

Bel-driven lathes are fast giving way to the kind shown here.

It's the Regal, a genuine LeBlond lathe for the professional or amateur.

It has an 8-speed selective sliding geared handstock, convenient controls and quick change of speeds with safety to the operator. Equipped with a one-piece apron with rigidly supported studs and gears. Quick change gear feed. Lead screw is reserved for chasing through use of a feed rod.

Lathe is delivered (with motor), ready to run.

Mail the coupon for interesting details.

**The R. K. LeBlond Machine Tool Co.**  
Cincinnati, Ohio



The Regal lathe is made in five sizes, 10 in. to 18 in. Prices range from \$275.00 to \$947.00, f.o.b. factory.



THE R. K. LEBLOND MACHINE TOOL CO.  
108 Regal Division, Cincinnati, Ohio.

Send descriptive literature of the Regal lathe.

Name.....

Address.....

City.....State.....

When writing to advertisers please mention Popular Mechanics



## MAKE LEAD SOLDIERS BY THE DOZEN!



### INDIANS, SAILORS, CAVALRY TROOPS

In an hour with one of my new Kaster Kits you can produce a whole regiment of men, each just as perfectly finished as professionally cast toys. Any live boy can make enough money in a week or two to pay for his entire Kaster Kit.

Easy to operate. Entirely electric. Have a complete toy factory right in your own home. Kaster Kit complete with 2 dies, 8 bars of lead, instruction book and complete set of handling and die-cleaning tools, only \$4.95.

*Agent*

## GILBERT KASTER KIT

FREE—Kaster Kit Carnival Book.

Just fill in the coupon and mail today for the most interesting toy book ever published.

The A. C. Gilbert Company,  
275 Everett Square, New Haven, Conn.  
Please send me a FREE copy of the new KASTER KIT CARNIVAL BOOK.

Name.....

Address.....

City.....State.....

**OTTAWA LOG SAW**  
only \$39  
GREATEST OFFER EVER MADE  
BIG BOOK FREE  
Make Money! Wood is valuable. Saw 15 to 20 cords a day. Does more than 10 men. Ottawa easily operated by man or boy. Falls crews—saves limbs. Use 4-hp. engine for other work. 30 DAYS TRIAL. Write today for FREE book. Shipped from factory or nearest of 4 branch houses.  
OTTAWA MFG. CO., 1741 -W Wood Street, Ottawa, Kansas

## Be a MASTER CRAFTSMAN



## NEW H & A Unit Plan Craftshop!

Now own extra money at home in spare hours. Home-work-working. Big field for profits. New H & A Unit Plan Craftshop puts you started at lowest cost. Complete shop includes 12 in. Hand Saw, 4-speed Lathe, 4 in. Bench Jointer, 6 in. Hip Saw Table, and Quick Change Motor. Machines that are used in thousands of commercial shops and homes everywhere. Portable. Electric. Just plug in light socket. Operate and speedily, priced lower. All units can be returned or 3 ft. by 6 ft. box with advance for ship. Just add notes with to each sub-base in only a few seconds. Enjoy all the advantages of individual motor driven machines, yet SAVE THE COST OF FOUR MOTORS. Buy one machine at a time or all at once. Write today for FREE catalog and low prices. Send now!

Heston & Anderson, 612 Stone Street, Fairfield, Iowa



IT'S NEW  
COSTS LESS  
SELLS FASTER

**\$16.00 Daily Easy**

Some Profit, if you book only a score orders. The amazing new "Vaughan's Safety Roll Sr." is the only up-to-date stationary Can Opener attachable to both wall and table. Lasts forever. Opens and holds all sizes and shapes of cans with standard rings without changing position of opener. Cuts tops out and in a jiffy. Simple and easy to handle—a child can operate it.

## 30 Million Homes

need this marvelous new invention. Salesmen coin big money daily in simple 3-minute demonstration. Amazingly generous profits make Vaughan's Safety Roll Sr. the one sure all-year around seller and money maker. Write quick for Free Sample Offer and sure-fire big money plan.

## AGENTS NATIONAL DISTRIBUTING CO.

549 W. Randolph St. Dept. 2-H Chicago, Ill.

## .... IN ONE TOOL

A tool post precision grinder for bench lathes and for off-hand grinding operations... easily changed into a high speed drill... one tool with many uses. Maximum speed, 20,000 R. P. M., grinds to finest limits. Write for descriptive bulletin.

\$27.50  
Complete



DUMORE CO., 52-16th St., Racine, Wis.

## SPRAY GUN Formerly ONLY \$7.50

This is the famous G.-V. Full Pressure Type All Purpose Spray Gun. Nationally advertised at \$30.50. A fortunate purchase permits us to offer them for only \$7.50. G.-V. guns operate at highest efficiency on less than 1/2 pump pressure required for action type. Works fast—fine for big outdoor jobs or repair shops. Can be used with hose or attached to large stationary compressor. Two adjustable spray tips. Order now. Send \$2.00 with order, balance U. S. D. Guaranteed Satisfactory.



Send for catalog on other spray guns with new listing at low prices.

National Jobbing & Export Co. Dept. 10-C 192 N. Clark St., Chicago, Ill.

## BASHFUL?

"Shame on you!" Are you nervous, embarrassed in company of the other sex? Blush before the eyes of strangers. Conquer the terrible fear of your speakers. Be cheerful and confident at your future! Your face is easily overcome as you can follow life in the future. Send 25c for this amazing book.

RICHARD BLACKSTONE, 2-4712 Flatiron Bldg., N. Y.



## Build Three Popular Models for \$1.65

Highest value ever offered Model Builders. IDEAL 3-in-1 Kits contain everything required to build three perfect, full-fuselage Models; all Parts, Fittings and Materials, also full-size Plans and Instructions for each Model. Your choice of two different Kits; each contains three of your favorite Models: Complete 3-in-1 Kit. \$1.65 postpaid Catalogue Models, Parts, Fittings, Supplies and Materials—5c

**IDEAL AEROPLANE & SUPPLY COMPANY, Inc.**  
26 West 19th Street, New York City

Two Separate Kits: Each containing three 16-in. Wing span, full-fuselage Models.

**No. 1 Contains:**  
The IDEAL Boomer  
The IDEAL Traveler  
The IDEAL Falcon

**No. 2 Contains:**  
The IDEAL Fokker  
D-7

The IDEAL Lockheed Vega  
The IDEAL Waro Taper Wing

When writing to advertisers please mention Popular Mechanics

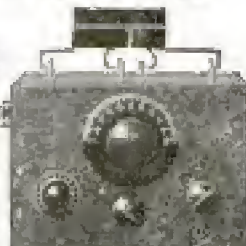


# AMAZING World Wide Aero Short Wave Receiver

Only **\$6.45** Listen in direct to

London,  
Paris, Berlin,  
Buenos Aires

A new radio thrill for you. Span the world with this set. Enjoy unique foreign programs from strange lands. Hear broadcasting stations from all over the world, via short waves. Your ordinary receiver cannot tune in these low-wave stations. World-wide receiver gets 14 to 550 meter stations with surprising clarity. Price of set, including 6 coils, \$6.45; price in foreign countries, \$7.75, postpaid.



## ASTOUNDING AUTO RADIO BARGAIN

**\$20.00**

This is the latest model 6 Tube Aero Pentode Auto Radio. Due to use of the latest Pentode tubes, this set is equal in performance to many 8 tube receiving sets. The circuit used is one which will be embodied in most of the expensive 1933 model auto radios. Complete set can be clamped on steering post of your car or can be operated by remote control from dashboard. Price of set only \$20.00. Set complete with tubes, batteries, dynamic speaker, antenna equipment and noise suppressors, \$39.50.



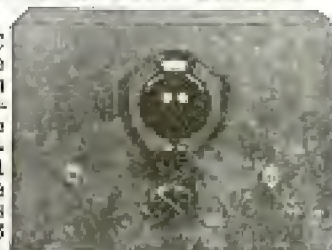
Send for Latest Catalog of Parts and Equipment

**CHAS. HOODWIN CO., Dept. M-2, 4240 Lincoln Ave., Chicago, Illinois**

## AERO SHORT WAVE CONVERTER

Only **\$12.50**

Convert your AC or DC radio set into a short wave Superheterodyne. With this converter on your regular set you will be able to tune in short wave stations from many different parts of the world. The Aero Converter contains its own filament supply. B voltage can easily be obtained from your regular set, or you may use a single 45-volt B battery. No plug-in coils. Single tuning dial. Very easy to tune. No whistles or squeals. Uses 2 UX227 tubes, one as oscillator and one as mixer. Price. AC model, less tubes, ready for operation, \$12.50. DC model for battery-operated sets, \$11.50. 2 matched UX227 tubes at 75c each, \$1.50; one 45-volt battery \$1.45.



## NEW AERO MIDGET USING THE LATEST TYPE PENTODE AND MULTI-MU TUBES

Price \$16.50. Here is a midget radio that everyone can afford that has performance, distance and tone qualities like the larger and much more expensive sets. Wonderful tone quality and selectivity. Full dynamic speaker. Full vision dial. Beautiful walnut finish cabinet. This is a 5 tube set and sells for \$16.50. Price of complete set of 5 tubes is \$1.50.



## GUARANTEED TO FLY 100 Ft. If Built Properly

A realistic, 12-in. r. o. model of the fast single-engine biplane, depends upon. A steady eye, indoors or out. Set includes aluminum propeller, shaft, rubber band, wire, streamlined wheel, wing, shock, landing gear, etc. Full building and flying directions. Sturdy 1/2" plywood construction—most easily built scale model on market. Can be built in 2 hrs. and will show best real aerobically than expensive sets. Model is indestructible container, postpaid in U. S. and Canada, only 30c. Orders are made easy.

**THE MIDLAND MODEL WORKS, Dept. S, Chillicothe, Ohio**



## DON'T CHOK ME JUST GIVE ME A HOT SHOT

HOT SHOT, amazing new electrical heated starts cars, trucks, tractors without choke. Starts gas, oil. Starts speed. Sparks R.I.E. Ignition O.K. —REDAI faulty. "It's a day easy" says Ben Akerman. "Runs RMR" wires King. Gold mine for agents. FREE Sample Offer. Act QUICK. RTARDON MFG. CO., Dept. F-12, Peoria, Ill.



## Improved Up-To-Date 8" Bench Saw

INVALUABLE  
TO HOME  
AND  
SHOP



Compare it with any saw double the price. Order at once. Yours saved is saving of money refunded.

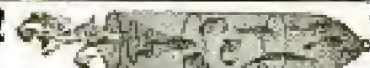
**UP-TO-DATE MACHINE WORKS**  
Dept. 120, 2911 S. Wabash Ave. CHICAGO, ILL.

This design embodies five exclusive features: (1) An Automatic Lifting Device, controlled by a conveniently located hand wheel; (2) Table can be tilted to any angle up to 45°; (3) The saw blade is completely enclosed and guarded beneath the table; (4) An opening is provided at the bottom of the saw enclosure for attaching a bag to collect the sawdust; (5) A hardened and ground shaft is used for mounting the saw. Saws together up to 2 1/2 inches thick.

**PRICE \$16.95**

## Catch Fish!

Eels, Minn, Muskrats with our new fishing universalized **STEEL WIRE TRAP**. Write for our **FREE TRAP OFFER** and **Bargain Catalog**. \$1 Box of our famous Fish Bait **FREE** to introduce our traps. **WALTON SUPPLY CO., 3592 JUNIATA AVE., ST. LOUIS, MO.**



## STERNO CANNED HEAT IN TUBES

QUICK  
SAFE  
EASY



... FOR  
EVERYBODY  
... EVERYWHERE ...

**NOW** packed in handy tubes—Instant, safe heat anywhere, at any time, at home, camp, in the shop. Send for free booklet showing many uses of Sterno in Tubes. Large tube costs 10¢. Use coupon.



**STERNO CORPORATION P. M. 12**  
9 East 37th Street, New York City

[ Send me your free booklet.  
I enclose 10¢ for full-sized tube.

Name \_\_\_\_\_  
Address \_\_\_\_\_









**BOYS! BOYS! BOYS!**  
**Throw Your Voice**

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

# THE VENTRILO

is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE**

**THROAT, or VENTRILO,** you can imitate many kinds of birds, animals, etc. Remember you get everything for **ONLY TEN CENTS**—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat, or Ventrilo**, and our big page catalog of novelties, tricks, puzzles, jokes, books, etc., **ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY 10 cents**



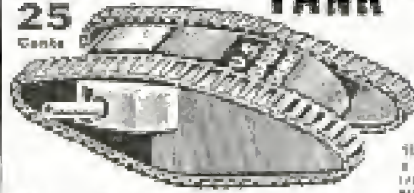
## BLANK CARTRIDGE PISTOL



This well-made and effective pistol is modelled on the pattern of the latest type of Italian revolver, the Thompson.

**Black Cat**—is  
essentially scarce—a burglar, thief, who,  
loaded, it will probably prove just as  
effective as a member with real bul-  
lets without the danger to life. It takes  
the standard .44 caliber Black  
Cartridge—that are obtainable almost  
everywhere. Special cash with order offer: 1 superior quality  
Black Cartridge Pistol, 100 Black Cartridges, and our new  
\$50 page Color Catalog of latest novelties all for ONLY  
\$1.50 shipped by express collect. Satisfaction or money back.  
Special Cash With Order Offer: 100 .44 caliber Black Cat  
Cartridges, so it will not accommodate local dealers. Special  
Cash With Order Offer for class \$50. No N.Y.C. shipments. Johnson Smith & Co.

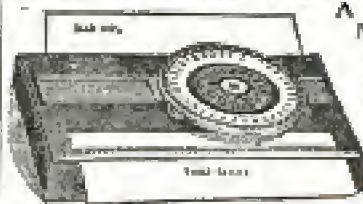
**U. S. BABY TANK**  
25 Cents



**It goes with real Yankee  
Pep—by its own power**

It will perform double the most wonderful stunts: 24, looks like. Price only 25¢ prepaid. Stamps accepted. JOHNSON SMITH & CO., Dep. 821 Pacific

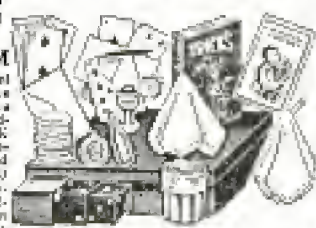
## The "Little Giant" Typewriter



**First Class Writing  
Machine For \$1.50**

## MAGICIAN'S BOY OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks. Enough for an Entire Evening's Entertainment..... \$1.00



**ANYONE CAN DO THEM**

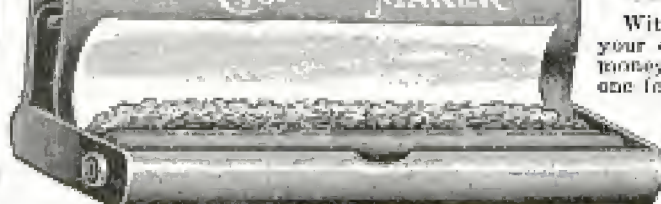
It is great fun, especially for your friends. Get this Complete Cabinet and you will be the cleverest fellow in your district. It contains the apparatus for the first-class tricks, including the MAGIC BALL and FARK TRICK. The wooden ball is placed inside, and upon replacing the lid, the ball disappears and is found in someone else's pocket! The HINDOO TRICK CARDS can be made to appear completely in less than five minutes! DISAPPEARING COIN BOX, in case, placed in the wooden box. Vanishes entirely or placed into a cup. Another demonstration: The GILDED GOLD TRICK. Coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found underneath! THE MOUTH TRICK is a seemingly endless supply of colored paper balloons coming out of your mouth; the DISAPPEARING HANKERCHIEF is hankie which vanishes; the REAPPEARING HING COIN TRICK; the FARK TRICK, in which you are able to open a tin drawer; the GREAT HAT AND HOCK TRICK is magic dice is placed on top of a hat, disappears, and is found underneath yet no one has touched the hat, and last, but not least, the GREAT PHANTOM CARD TRICK, or two from the leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other tricks and stunts are included with each set. You will be able to impress the audience thoroughly. Price, actually \$10.00. **JOHN R. HARRIS & SONS**

**RESURRECTION PLANT** Great curiosity. Place in water, plant opens

**250 MAGIC TRICKS 10c**

An excellent little book containing nearly 300 Tricks for parlor or stage. Tricks with cards, coins, handkerchiefs, eggs, rings, glasses, flowers, shrimbles, sponge, bottles, mugs. Explains the mystery of the floating hand, and secrets of other amazing feats of magic and illusion. Also Second Sight, Shadowgraphy, etc. So simple a child can perform them. Fully illustrated. Sent postpaid for 25c.

**RAPID CIGARETTE MAKER**



## PID CIGARETTE MAKER

OLL YOUR OWN      SAVE MONEY

Send remittance (Postage Stamps accepted) for all articles listed above, also in our other ad on previous page

**JOHNSON SMITH & CO.** Dept. 821 **Racine, Wis.**



# A NEW THRILL IN RADIO

## AT LAST ITS HERE! SHORT WAVE RECEPTION

**WILL FIT ANY SET \$2.50 NO WIRE TO CUT**

**JUST PLUG IT IN YOUR OWN SET.**  
Pin Money Order or Check to this Ad and Mail to

**DAVE'S**

1309 BROADWAY - DETROIT, MICH.

WE PAY THE POSTAGE

# New Kind of Fuse Plug "6-in-1"



New, improved, patented 6-in-1  
one fuse plug approved by

**Underwriters' Laboratories**

Amazing invention bringing fortunes to agents. Our men are making money hand over fist selling 6-in-1 Fuse Plugs direct to users and at wholesale. Biggest repeater you ever saw. Every demonstration means a sale.

**Most Necessary Invention  
in Years**

Think of it! Six fuses in one plug! When one fuse blows out, "a turn to the right brings back the light." Necessary in every home, store, factory—in fact, every place that uses electric power. Small towns, large cities, rural communities, farm homes—the market is everywhere.

**FREE Demonstrator**

Fascinating demonstration attracts everywhere. Proves necessity of the 6-in-1 Fuse Plug. Outfit given free to agents. WRITE at once and start making money. Send 25c for a sample 6-in-1 Fuse Plug and complete proposition.

**6-in-1 Fuse Co., Inc.**  
Dept. 136, 801 Madison St., Chicago, Ill.

**A TURN TO THE RIGHT  
BRINGS BACK THE LIGHT**

**\$500  
to \$1000  
a Month**

Actual earnings of many 6-in-1 agents. Orders come thick and fast. You, too, can make big money.

**AGENTS  
Distributors**

Territory still available for exclusive distributors. Small capital starts you. The business pays for itself out of profits. Don't delay!

**ACT NOW!**

# Why Pay More?

**3" Lathe Chuck \$3.50**  
**4" Chuck \$4.50**



Why do without a Chuck or pay big prices for the Chuck you need? At last, a high-grade Chuck at a price you can afford! The WATSON JUNIOR CHUCK. Does anything any Chuck of like size and character will do, regardless of price. Can be tilted to any lathe and holds work in any position, concentric or eccentric. Has heavy cast body, hardened screws and 4 hardened steel, reversible jaws. Order the Chuck you need today on our guarantee of satisfaction or money refunded.

Chuck sent postpaid on request of office, or send \$1 and pay balance on delivery, plus a ten cent postage. Shipping weight, 1 1/4 lbs.

**THE WATSON MFG. CO.**

112 Watson Bldg.

Toledo, Ohio, U. S. A.

# AIR MOTOR—3 cylinder

Complete knock-down kit, Model C, \$1.25

Assembled motor \$2.00. Knock-down air tank kit \$1.50. Finished air tank \$4.00. Cylinders and one model piece plus 10 cents.

Model Aviator Products, Dept. 79  
2335 Eastwood Avenue CHICAGO



# INCREASE YOUR POULTRY PROFITS!

By proper Breeding, Feeding, Housing, Culling and Marketing **AMERICAN POULTRY JOURNAL** tells how to do it, and in addition a series of

## COLORED PICTURES

with explanatory text tell and show many things you should know. They are not just colored pictures of birds but pictures of an educated man, something never before shown by a poultry paper. 12 issues of **American Poultry Journal** contain about 1000 pages—

Price 25c a year—5 years \$1.

**AMERICAN POULTRY JOURNAL**, 14-536 S. Clark St., CHICAGO

# RAISE CHINCHILLA

AND NEW ZEALAND WHITE

**FUR RABBITS** Make Big Money

AND CONTRACT FOR ALL YOU RAISE

Prices range up to \$2.50 each. Large illustrated book, rabbit and contract, also copy of

**Our Farming Magazine**, all for 50c. **STANLEY'S**

**OUTDOOR ENTERPRISE CO.**, Box 147, Holmes Park, Missouri

# WONDERFUL NEW BOOK FREE

**NATION'S GREAT POULTRY MANUAL:** Facts about breeding, feeding, diseases. **BERRY'S TESTED CERTIFIED CHICKS GUARANTEED TO LIVE 20 DAYS** or replacement at 14 price. 52 VARIETIES. **NEW LOW PRICES** chicks, fowls, supplies and equipment. **BERRY'S POULTRY FARM**, Box 29, Clarinda, Iowa

# NEW SQUAB BOOK FREE

Breed 2000 squabs and make money. Sold by millions at highest prices than chickens. Raised in one month. Send four cents stamp for postage on brand new big 40p. illustrated free book how to breed and profit by fast sales method. **Thirtieth year.** **Plymouth Rock Squab Co.**, 634 N. St., Melrose, Massachusetts

# THE MOST BEAUTIFUL SHIP MODEL EVER MADE

**The Barbary Pirate "FELUCCA"**

new and now ready. Hull fully shaped and sanded; all parts and accessories supplied cut to fit and ready to assemble.

**"You Can Build One" for only \$4.50, and postage.**

Wonderfully designed and accurately executed, this model, brilliantly colored, is a lasting ornament, and its construction a fascinating pastime. Sent C. O. D. parcel post in U. S. or Canada.

Santa Maria, Mayflower, Covered Wagon or Coach Model \$4.50. Constitution \$6.00, Flying Cloud \$4.00 or a Spinning Wheel \$1.00. Send 2c stamp for catalog.

**MINIATURE SHIP MODELS, INC.**  
90 King St., Toronto Dept. RT, Perkasie, Pa.

# Deaf 20 Years

**But now I hear** and will tell any deaf person FREE, who writes me, how I got back my hearing, and relieved head noises by a simple, invisible, inexpensive method which I myself discovered.



Geo. H. Wilson, President  
Wilson Ear Drum Company, Inc.  
1181 Todd Bldg., Louisville, Ky.

When writing to advertisers please mention Popular Mechanics



The Old Reliable Credit Jewelers

# LOFTIS

Dept. D-691  
30 N. State St.  
Chicago, Ill.

## DIAMONDS WATCHES

### CASH or CREDIT

**GENUINE DIAMONDS GUARANTEED**

Our Diamonds are blue white, of fiery brilliancy, magnificent in their perfect settings.

**HOW TO ORDER**  
State article desired—name of employer—kind of work you do—how long in position—age—married—where born—how long there. **EVERYTHING CONFIDENTIAL.** Send first payment, OK good sent for your FREE examination on request.

**Money Back if not Satisfied**

**CREDIT TERMS:** One-tenth down; balance weekly, semi-monthly or monthly at your convenience. **WEAR WHILE YOU PAY**

**SEND FOR BIG FREE CATALOG.**

**We Carry All Makes of Standard Watches**

HAMILTON No. 992, 21 Jewels, Adjusted to 5 Positions, Yellow \$60  
Gold-filled 26-year Case

ILLINOIS "BUNN SPECIAL," 21 Jewels, Adjusted to 5 Positions, \$60  
Yellow Gold-filled 26-year Case

**All Railroad Watches sold on convenient credit terms**

# NEW "Driver" 10c MAGAZINE



BLUEPRINT  
in every issue

In This Issue  
**AN END TABLE  
BECOMES A  
BRIDGE TABLE**

Half-hour Table  
Plans  
How a Naval Engineer  
Uses Drums, Tacks  
What Driver Owners  
Are Doing  
The Old Timer Sinks  
Questions and Answers  
Child's Cotton Stock  
Big Saw Projects  
Joining and Overlaying

Send for  
this issue

## NEW THINGS TO MAKE

Homecrafting has developed to the stage where craftsmen deserve a magazine of their own, devoted exclusively to woodworking. Realizing this need, "Driver," the leading manufacturer in the field, has developed The HOME CRAFTSMAN so that every workshop owner can derive keener satisfaction from his hobby and his equipment.

The HOME CRAFTSMAN describes new things for you to make. New projects for advanced craftsmen. Simpler projects for the beginner. Shows you how to start each job, gives all dimensions. Describes new tools. Tells how to use. Sponsors "Questions and Answers" column to solve your problems. Includes many other features. Has 24 pages of selected material. Edited at the work bench where every article described has been made. Full size blueprint in EVERY issue.

### COMPLETE BLUEPRINT 17" x 22"

Get this first issue with complete blueprint of unique Bridge Table-End Table. If unable to buy The Home Craftsman at your local "Driver" store, send coupon.

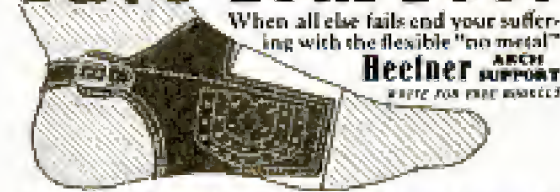
**WALKER TURNER CO., Inc. Plainfield, N. J.**

The HOME CRAFTSMAN, Dept. M, Plainfield, N. J.

Enroute: You may send me the first issue of The Home Craftsman, with complete blueprint 17 by 22 inches of the Bridge Table-End Table. I am enclosing 10 cents.

NAME.....  
STREET.....  
CITY.....

## Save Your Feet



When all else fails and your suffering with the flexible "no metal" **Beelner** ARCH SUPPORT

BEELNER ARCH SUPPORT CO. 634 M. E. Taylor Building, Louisville, Ky.

## Get Into A Business of Your Own—EARN \$150 to \$300 Monthly

### AUTOMATIC AIRSERVICE

Dependable, space saving devices bring customers to your door. Only \$12 Monthly. 30 Days Trial.

### PAINT SPRAY PROFITS

Paint entire house, interior, exterior. One man does work of two. Fully available. Only \$12 Monthly. Will pay its own way.

### 8-HOUR BATTERY CHARGING

Recommended by leading battery makers. Highest profit, double profit. No special experience required.

### 20 MINUTE Car Washer

Six professional looking cars—more 2-3 times, does better job. One man only \$17 Monthly.

### 30 Days' Trial, to prove it. Easy. Check terms of the terms and mail to

**HOBERT BROTHERS**  
Box M-121, Troy, Ohio

**Only \$16 Monthly—30 Days Trial to Prove it** NO OBLIGATION

When writing to advertisers please mention Popular Mechanics



**For Sport  
or Utility**

## NORTHLAND SKIS

Superior in design, materials, and construction. They enjoy an international reputation for speed, durability and ease of handling. Models for every purpose. Look for the deerhead trademark. Write for free booklet, "How to Ski."

**Northland Ski Mfg. Co.**  
World's Largest Ski Mfrs.  
95 Merriam Pl.  
St. Paul, Minn.



## THREAD CUTTING LATHE



9" Swing; 18" between Centers  
Lever controlled reversible Feed, permits cutting right or left threads. **\$55**  
A real Lathe. Price as shown  
12" BAND SAW, ROLLER GUIDES, TABLE TILTS, \$30  
A powerful, practical Saw. Write today for catalog on other Machines.  
**ROSSBACHER MACHINE CO.**  
1516 Farwood Avenue Toledo, Ohio

## Rupture No Longer Spoils My Fun

"Now that I am rid of my rupture and do not wear a truss, I enjoy dancing again. Many strenuous activities are pleasures, because I am not handicapped in any way. My work is no longer a task—I enjoy it. No one would ever believe I was crippled by rupture."

This is the way people write us after ridding themselves of rupture by using **STUART'S ADHESIF PLAPAO-PADS**.

Stacks of sworn endorsements report success—without delay from work.

Plapao-Pads cling to the body without straps, buckles or springs. Easy to apply—economical and comfortable.

Convince yourself by actually testing Plapao at our expense. Send coupon today.

Test of Factor "PLAPAO"

**FREE! ACT SPEEDILY**

MAIL COUPON BELOW TO-DAY

Plapao Laboratories, Inc.  
789 Stuart Bldg., St. Louis, Mo.

Send me FREE Trial Plapao and 48-page book on Rupture. No charge for this now or later.

Name.....

Address.....

When writing please mention Popular Mechanics



## A BOAT for YOU



Build yourself a beautiful Brooks Boat of classy design and exceptional seaworthiness. We furnish the best materials

obtainable, designed and cut by master craftsmen. You assemble the boat in your spare time. Save  $\frac{1}{2}$  the builder's cost and have the fun of doing it yourself and knowing that you'll have the safest, strongest, finest craft obtainable. Our catalog illustrating 38 cruiser, runabout, outboard, sailboat and rowboat designs sent anywhere on receipt of 10c.

Dept. 10-M

**BROOKS BOAT  
COMPANY, INC.**

Saginaw

West Side, Mich.



## AMERICAN METHOD Pays Big Profits

**\$25<sup>00</sup>  
Per Day**

Stop looking for a job. Get into business for yourself. No matter what sort of work you have been doing, you can quickly become independent working from using the American Method. Ask about this new and amazingly successful system. No obligation.

**AMERICAN FLOOR SURFACING MACHINE CO.**  
532 S. St. Clair St. Toledo, Ohio



## JUMPIN' CATS!



IT'S

ALMOST

## CHRISTMAS!

SOLVE your gift problem  
with the best year 'round  
present money can buy.

Send **COLLEGE HUMOR**  
To your friends

Special Christmas Offer:

1 year - - \$3.00

2 years - - \$5.00

Two 1-year Gift Subscriptions \$5.00

I want to provide a merry year for

Name.....

Street.....

City..... State.....

Mail to 1050 N. LaSalle St.,  
COLLEGE HUMOR Chicago, Ill.







## HEATH always makes this "three point" landing

PERFORMANCE, SAFETY, ECONOMY—these three points in flying—are the foundation of HEATH'S 23 years of success. And on these three points HEATH is not challenged by other planes in its class.

**Performance?** World's altitude record; first place at National Air Races for years; scores of enthusiastic owners.

**Safety?** Successfully meeting the daily demands of student and cross country flyers; sturdy and well engineered throughout with perfect control at all speeds.

**Economy?** Gas and oil by the spoonful instead of in barrels; reliable motors; simple, inexpensive maintenance; low insurance and amortization. And all these advantages come to you at amazingly low cost—you can own a HEATH for only \$1074. Or build one yourself for only \$269. You can buy your ship out of your income and pay for it in small monthly installments.

Write today, enclosing 15c for full information, and our new special offer.

## HEATH AIRCRAFT CORPORATION

Dept. P-12,

Niles, Michigan

### "Little Cut-Up"



**Every Workshop Needs This Saw**  
Complete with 14 H.P.A.C. 110 V. G. E. Motor  
Full bearing drive to Heavy Duty Tension Springs.  
1750 strokes per min. No drive parts. Cut any  
wood 2 in. thick, 16 in. deep. Blade or guide cuts  
as fast as you can follow a line. Cuts floor, plywood,  
skullie, aluminum, brass and other soft metals.  
Thousands of use in home shops, factories, schools, etc. Drive,  
with 4 blades, \$20 each. H. B. "Lumber" points. On brass side  
drives (perfect Motor) to drive (perfect) to run. (perfect)  
H. P. motor, \$22.50. Extra blades \$1 each. Blades (perfect)  
per set. Literature on request or send order and will  
ship C.O.D. or from our nearest dealer. Manufactured  
and distributed by

Beebe Bros., 3215 1st Ave. S., Seattle, Wn.

## PANTS MATCHED

**Don't Throw Away That Coat and Vest!**  
Save \$15 or more! Let us match your coat  
and vest with new trousers tailored to your  
measures. Have the price of a new suit. Over  
100,000 patterns. Most sample of suit, or your  
vest which will be returned with FREE  
FREE Sample for your approval. **SAMPLE**  
**Match Pants Co.** 20 W. JACKSON BLVD.  
Dept. A-15 CHICAGO

**MONEY SELLING GENUINE NEON**  
**Changeable Letter SIGNS!**  
Men earning high as \$30 daily  
Milwaukee Neon Sign Co., Dept. 1, 722 Lakeview Ave.  
MILWAUKEE

**SALE Electric**  
**VACUUM CLEANERS**  
Completely removed and  
re-installed—\$200.00. Or  
order today. State whether  
you want Eureka,  
Hoover or Apex. **SEND NO  
MONEY**, largest dealer price  
guaranteed. \$10.95. E. O. G.  
Detroit. Give name of  
Hoover, Eureka, or Apex.  
\$15.95. \$10-150 Volts, any  
size. New attachments for all  
models \$10 to \$12.50 when  
\$15.95. AGENTS and dealers  
write.  
Re-New Mfg. Co., Dept. B (Factory), 2262 Grand Avenue, Detroit, Mich.

**\$10.95**  
2 YRS  
GUARANTEE

Send for colored illustrated

**FOLDER free**  
with lowest prices yet.

## Genuine BRAND NEW CORONA Model No. 3 at NEW LOW PRICES

ONLY  
**\$39.95**  
on Easy  
Terms

Small Carrying  
Case



ONLY  
**10c**  
a day

## Yours for Only \$1.00 DOWN



Hurry! If you want to be in on the biggest "BUY" in Portables. Only a very limited number of these Brand New Coronas available at this Special Low Price and Easy Terms. Don't wait. Here's your chance to get a wonderful nationally advertised Corona at a real bargain. Has up-to-date improvements and carries our regular New Machine iron-clad guarantee. Remember this exceptional offer good only while supply lasts.

## Sent on 10 Days' Trial

Send for your 10 days' trial of this new Corona Now. Try it the entire time at our risk. See for yourself the neat, smooth, perfect work it does. Note how easy and quiet it runs. Learn the joy and convenience of writing on a portable. Write all your personal and business correspondence during our generous trial—without obligation to buy. Compare its many improved features—its neat, compact and sturdy design; its superior workmanship; and its bright sparkling finish with other machines costing much more.

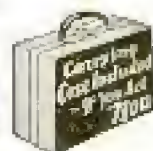
## Iron-Clad Guarantee

Act At Once—only \$1 brings this shiny new Corona for full 10 days' trial—Write all the personal and business letters you want. If you decide to keep it send only \$3 a month until the special low price of \$42.00 (term price) is paid.

## FREE Carrying Case

Beautiful leatheroid carrying case with nickel trimmings is included. Free with each Corona while limited quantity lasts. If you have ever wanted a wonderful portable—here's your chance. Don't wait until it's too late. Send the coupon NOW.

**LIMITED OFFER**—At this bargain price and unheard of easy terms—10c a day—these wonderful New Coronas will go in a hurry. Remember the Corona comes to you fully complete—box of instructions and all—nothing extra to buy. Send at once!



International Typewriter Exchange (Corona Division)  
231 W. Monroe St., Chicago Dept. C-1215

Send the Corona P.O.B. Chicago for 10 days' trial at the special low price offered. I enclose \$1.00 deposit with the understanding that if I am not perfectly satisfied I may return it Express Collect and get my deposit back. If I decide to keep it, I will send \$3.00 a month until I have paid \$42.00 (term price) in full.

Name.....Age.....  
Address.....  
Town.....State.....

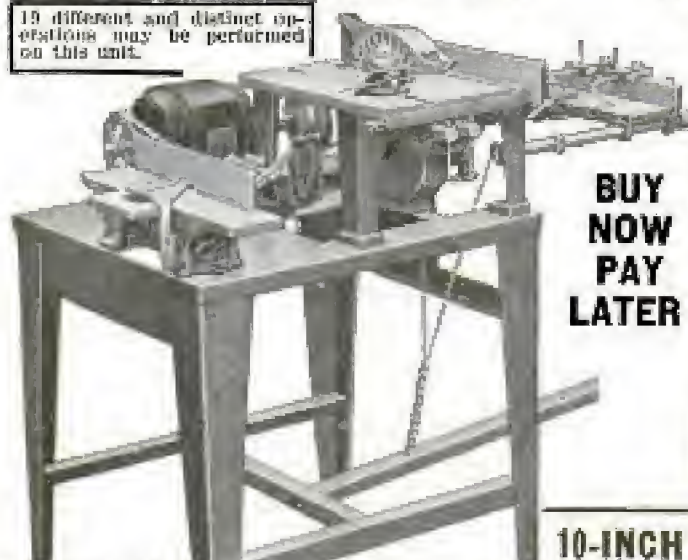
When writing please mention Popular Mechanics



# LATEST BOICE-CRANE DESIGNS

## New Models—New Low Prices

19 different and distinct operations may be performed on this unit.



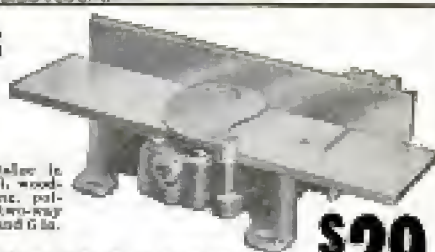
**BUY  
NOW  
PAY  
LATER**

Here is an ideal woodworking unit for any man's shop. It is a real BOICE-CRANE achievement. Consists of a solid steel stand—26" x 26"—on which is mounted a 12" x 17 1/2" Saw, a Mortising attachment and a 4" ball bearing Jointer. The saw has a tilting arbor which raises, lowers and tilts. The table is solidly bolted to the legs, and remains flat and level at all times. The mortising attachment may be permanent, as it is in no way interferes with the free operation of the other units. Has full 15" square chisel capacity. Powerful levelling makes toughest mortising jobs easy. Choice of 1/2 or 3/4 h.p. motor. The low price of this fully equipped stand will amaze you. Write for catalog.

### 4" JOINTER

**\$12**

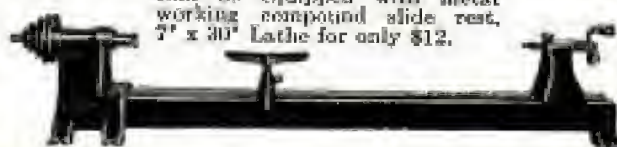
Another Boice-Crane Value in accurate, swift, powerful, wood-working machinery. Long, polished table; steel head; two-way tilting brace. Also 4 in. and 6 in. ball bearing jointers.



### NEW BALL BEARING LATHE...

**\$29**

No better lathe built for the price; 11" x 42", only \$29. Can be equipped with metal working compound slide rest, 7" x 30" Lathe for only \$12.



### 10-INCH

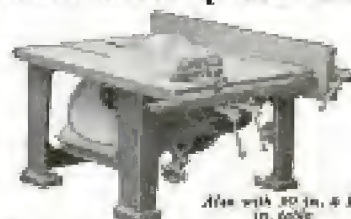
### Jig Saw

**\$12**

Sturdy, heavy duty machine. Table tilts. Also a 20" Jig Saw.



### NEW SAW \$32.50



Notice how saw tilts while table remains rigid and level. Arbor also raises and lowers. Full length rip guide. Polished 15 in. by 17 1/2 in. top. Graduated scales for ripping, cutting and bevelling.



### 17-INCH SHAPER

**\$49**

A practical machine in every respect. Ball Bearing. Cast-iron design—spindle raises and lowers. Cuts mouldings on straight or curved pieces. Dovetails, routs, mitres, dados, etc.

### Send for Catalog

Extra large 60-page catalog with big 8 1/2" x 11" pages filled solid with pictures, descriptions and interesting information. Sent anywhere on receipt of 10c coin or stamps (which only pays part of mailing cost). Don't buy before you investigate the new Boice-Crane Line.

**W.B. & J.E. BOICE**

DEPT. PM-1H

TOLEDO, - - OHIO



### 12-INCH BAND SAW

Loss Guards **\$30**

Strong, accurate and substantial. Tilting table. Also a 14" Band Saw at an attractive price. Catalog shows full line.

# DIAMONDS

(Sent Free Examination)

## here 60% of Market Prices

10 large loan firms combined (world's oldest, largest association of its kind—rated over \$1,000,000,000). Loans money on diamonds. A few such loans not repaid. Diamonds originally sold by outstanding jewelers. Of course we can loan but a fraction of real values. You get the advantage in Unpaid Loans at cash prices you can try to match at full 60% more. Every liberal privilege.—Examination free—No obligation to buy.

### Free List of Unpaid Loan Diamond Bargains

Every diamond accurately described. Radically low prices for any quality, any size. Written guaranteed amounts you can borrow (like Insurance Policy loan guarantee). Get full details of free examination offers. You don't risk a penny. 1/2 century old house (predecessors: Bank of Pgh., Union Trust Co., 3rd Nat'l Bank). Lists limited—Send now. For FREE LIST write today to...

**Jos. DeRoy & Sons, Opp. P. O., 1921 DeRoy Bldg., Pittsburgh, Pa.**



Unpaid Loans  
Low as  
**\$60**  
per Carat

When writing to advertisers please mention Popular Mechanics



# Make a TRACTOR from Your OLD CAR

## BUILD

### YOUR OWN

tractor during spare time and have it ready for use when needed!

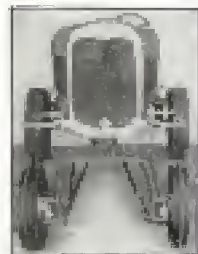


## GREATLY REDUCED PRICES

To meet present conditions, we have greatly reduced prices on SHAW Tractor Equipment. Get your SHAW Equipment now and build tractor during spare time—or buy it complete.

**EASY TO  
BUILD  
WE TELL  
YOU HOW**  
For Model "T" and "A" Fords, Chevrolets and other make cars.

## Cuts Your Production Cost!



Front view of SHAW Tractorized Model "A" Ford. Shows New HIGH ARCH, allowing for clearance of tall corn, cultivating 1 to 2 rows at one time. Regular cultivator beams may be used.

**MAKE** more money! Do it by making a powerful, dependable tractor from your old Ford, Chevrolet or other old car—with sturdy SHAW Tractor Equipment. The SHAW Tractorized Car, by saving valuable time and costly labor, greatly lowers production cost. Pays for itself in one season!

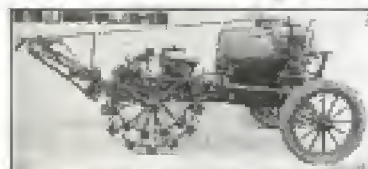
**Amazing All-Around Performance**—Does more for small amount of money invested than any other tractor. Tests have proved it does all farm power work as well as expensive tractor. Cultivates 15 to 20 acres per day. Turns about 5 to 10 acres per day with mold-board plow. Handles 16-in. plow, or two 12-in. plows nicely. Easily pulls heavy, steel road drag. Can also be used to seed, harrow, furrow, harvest, haul; run log saws, feed grinders, concrete mixers, pumps and other belt machinery.

**Low Cost**—You can have a SHAW Tractor at surprisingly low cost—on Easy Payments. SHAW Tractor Equipment costs very little—at New Reduced Factory-to-You Price. If you haven't an old car, you can pick up an old Model "T" Ford or Chevrolet for \$5 to \$25; or a Model "A" Ford chassis, which has had the body wrecked, very cheaply. Many Model "A" Fords are now being converted into SHAW Tractors. SHAW Equipment, bought now for a Model "T" Ford, can later be installed on a Model "A." Many attach SHAW Equipment to other makes of cars.

**Anyone Can Attach SHAW Equipment** quickly and easily, using only monkey wrench and screw driver. You don't have to be a mechanic. We furnish all parts, easy-to-follow directions. Can be attached to full-length or saved-off chassis.

**Make Tractor Now**—Remember Reduced Price is subject to change any day. So make your tractor now. **SAVE MONEY!** Mail Coupon for full information—TODAY!

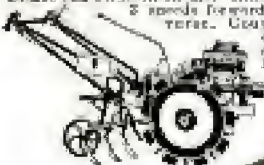
**SHAW MFG. COMPANY**  
Dept. PM12 CALESBURG, KANSAS



**SHAW DU-ALL Tractor and Garden Sprayer** kills insects that destroy farm, orchard and garden products. Reaches tops of tall trees. Eats for orchard and potatoes. Rids lawn and estate of ticks and fleas. Has 24-gal. barrel. Two 16-oz. discharge hoses with 8-ft. pipe extension and nozzle. Operates for 8 hours. Pressure 200 lbs. Mounted on regular SHAW DU-ALL Garden Tractor—see below. Complete brings details. Reduced Price, 30-day Trial Offer, Easy Payment Plan.

### SHAW DU-ALL GARDEN TRACTOR

Great time, labor, money-saver—for farms, truck gardens, nurseries, poultry houses, estates, etc. Plows, harrows, weeds, cultivates, hauls, mows, feeds, mows, mows, mows, pumps, etc. 8 gears, 1 to 6 horsepower. Costs 2 to 4 per hour to run. Brakes and differential gears. Heavyest shaft 5 speeds forward, and reverse. Coupon for details. 30-day trial offer.



**SHAW Tractorized Model "T" Ford of Jaro, Kratz, & Sons** crafted. 8-h.p. equipped with extra wide wheels and rubber tire attachments.



See also about New HIGH ARCH, which enables tractor to clear corn 30-in. high, cultivating 1 to 2 rows at a time.

**DOES  
ALL  
FARM  
WORK**

SHAW Tractorized Ford plowing.

## FREE BOOKS

Coupon below brings FREE Book, containing full information, new Reduced Price and Easy Payment Plan on 1932 HIGH ARCH Model, and FREE SHAW DU-ALL Garden Tractor Catalog. Mail Coupon TODAY!

**SHAW  
MFG. CO.  
Dept. PM12.  
CALESBURG, KANSAS**

Gentlemen: Please send me at once the FREE Literature checked below, and New Reduced Price. No obligation on my part.

☐ Literature on Making Old Car into Tractor

☐ Literature on SHAW DU-ALL Garden Tractor

☐ Literature on SHAW DU-ALL Garden Sprayer

☐ Generous Introduction Offer

**MAIL COUPON FOR FREE LITERATURE**

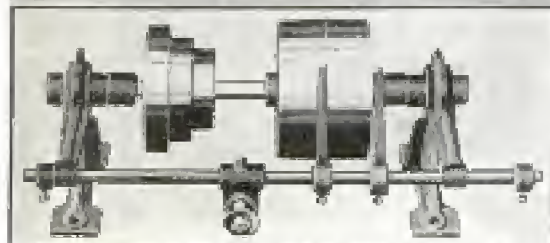
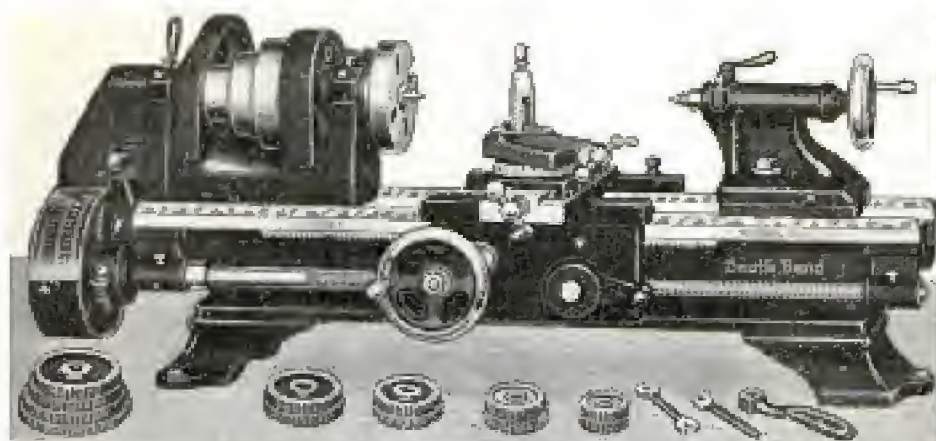
Name.....  
Address.....  
Town..... State.....

When writing to advertisers please mention Popular Mechanics









8" x 24" Junior Back Geared Screw Cutting Precision Bench Lathe with Tight and Loose Pulley Countershaft and Equipment, \$20.00 down, \$7.00 per month. **\$100** Net Weight 175 lbs. f.o.b. factory

## Announcing The New South Bend Junior

# 8"

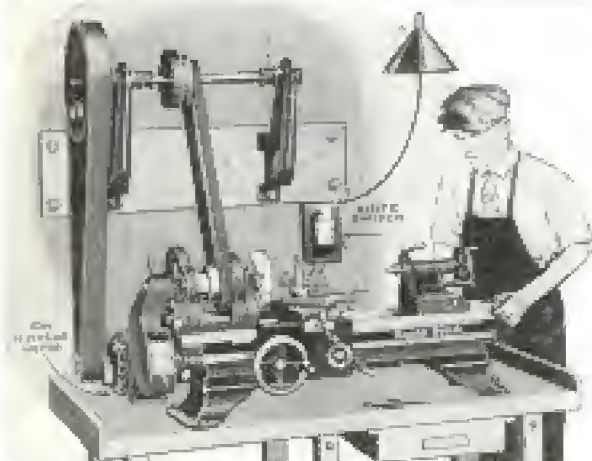
BACK GEARED  
SCREW CUTTING  
PRECISION LATHE

**\$100 AND UP**

Prices of 8" Lathes with Tight and Loose Pulley Countershaft

	Between Centers	Net Weight	Plain Rest	Compound Rest
8" x 24"	6"	175	\$100.00	\$115.00
8" x 30"	12"	190	105.00	120.00
8" x 36"	18"	205	110.00	125.00
8" x 42"	24"	220	115.00	130.00

**EASY PAYMENT TERMS** as low as \$20 down and \$7 per month for 12 months will place this new precision lathe in any shop in the United States. Write for further details.



8" x 24" Junior Back Geared Screw Cutting Precision Bench Lathe with Simplex Countershaft instead of Tight and Loose Pulley Countershaft with Plain Rest. \$100.00

Prices of 8" Lathes with Individual Motor Drive

	Between Centers	Net Weight	Plain Rest	Compound Rest
8" x 24"	6"	175	\$116.50	\$131.50
8" x 30"	12"	190	121.50	136.50
8" x 36"	18"	205	126.50	141.50
8" x 42"	24"	220	131.50	146.50

In the tabulation below we itemize motor and complete motor drive equipment so that you can purchase only the parts that are needed. This applies to any 8" bench lathe with various bed lengths.

**Itemized Prices for Motor Drive Arrangement**  
1/2 H.P., 1750 R.P.M., Single Phase, A. C.

Motor	\$12.00
Motor Pulley	1.25
Enclosed Type Knife Switch	1.50
Belting, Motor to Countershaft and Countershaft to Lathe	1.75
<b>Total</b>	<b>\$16.50</b>

The New 8" Back Geared Screw Cutting Precision Bench Lathe illustrated above is announced on the Silver Anniversary of the South Bend Lathe Works, having specialized for 25 years in building lathes exclusively. All the quality, precision, accuracy and up-to-date mechanical features which characterize the complete line of South Bend Lathes are incorporated in this new remarkable lathe.

Recommended and manufactured for auto service, electrical work, tool room work, manufacturing, home work shop, laboratory use and for all classes of fine precision jobs—can be used in the tool room the same as in the small shop as it has the accuracy and precision for gauges, small tools, dies, etc.

Features include back geared headstock— $\frac{3}{4}$ " hole in spindle—set-over tailstock— $\frac{3}{4}$ " diameter lead-screw—power feed to carriage—plain rest for holding tool—cuts screw threads 4 to 40 per inch—takes 1" belt—six spindle speeds—weighs 175 pounds net.

A full line of attachments are available at similar low attractive prices for this lathe including draw-in collet chuck attachment with collets, milling attachment, taper attachment, grinding attachment, thread dial, chucks, tools, accessories, etc., all for precision work.

## Write for new Circular No. 8

describing and illustrating in detail all the features of this new up-to-date bench lathe. Sent free, post-paid, to any address. Fill out and mail coupon below.

### SOUTH BEND LATHE WORKS

642 East Madison Street, South Bend, Indiana, U. S. A.

Gentlemen: Please send circular No. 8, illustrating and describing the New South Bend Junior 8" lathe.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_



**AGENTS MAKE UP TO \$15 A DAY**  
WITH THIS PERFECT FOUNTAIN PEN THAT  
WRITES AS SMOOTH AS A PENCIL.

## GUARANTEED A LIFETIME

### FEATURES OF THIS PEN

makes carbon copies; adjustable ink feed for lessening or increasing flow of ink; rubber sponge keeping point moist, therefore will write instantly; double point as illustrated; gives double service; simple construction, nothing to get out of order; comes in ladies' or men's style. **EVERYBODY IS A PROSPECT FOR THIS PERFECT PEN.**

NO. 8 PEN ILLUSTRATED  
SELLS FOR \$1.25

**\$39¢**

**DOZ.  
\$2.95**

**MA  
P  
L  
E**

**M  
O  
N  
E  
Y**

**BACK IF  
NOT PLEASED**

Many customers claim this pen writes and looks as good as a \$7 pen; if you do not think so, return it and your money will be refunded. What could be more fair?

**NO. 30 PENCIL  
TO MATCH NO. 8  
FOUNTAIN PEN**

has repel and expel movement, compartment for leads and rubber eraser. Comes in ladies' or men's style and matches the pen perfectly. Very attractive pencil; retails for 35c.

**SAMPLE PENCIL 15c  
DOZEN PENCILS \$1.45**

You can sell pen and pencil as a set for 98c and make over 100% profit.

## FREE WHOLESALE CATALOG

showing over 1000 fast sellers, such as Christmas Cards, ladies' and men's hose and underclothing, shoes, toys, pearl and crystal necklaces, combs, automobile accessories and many other articles, all at WHOLESALE PRICES. SEND FOR YOUR COPY NOW.

**SPORS IMPT. CO.** 1031 MAIN ST. LE CENTER, MINN.

## Model Ships

We can supply construction sets and all sorts of parts such as semi-finished hulls, blocks, masts, rigging, sails, various electric wires, apparatus, batteries, etc. for building real live scale models of the Dredger, Frigate, Battleship, Gunboat, Flying Cloud, Construction, Spanish Galleon, Bluebird, River Steamer, Scow, etc. of the Sea, Bluebird, Frigate and many others. Also special construction sets for sailing, radio boats, power boats, model steam engines, propellers, etc., and live boats for the model maker. Our large 36-page photographically illustrated booklet contains valuable information and hints for building ship models in addition to the above articles. Many people only slightly interested in model have become greatly enthused upon receiving this booklet. A copy will be sent postpaid upon receipt of 15 cts. from postoffice.

**Model Ship Supply Co., Dept. A, Mineola, N. Y.**



**DOES THE WORK OF  
A HIGH PRICED IRON**

Soldering is easy with this handy electric iron. It plugs in on any current, quickly giving you a red hot point that stays hot! Used by professionals everywhere. Has replaceable forced copper tip; highest grade nickel-chrome heating element; dark mahogany anti-burn handle. Wt. 16 ozs., length 22 1/2 inches, 6 ft. flexible cord. A boon to the amateur, for any soldering job! Price complete \$2.75.


*If your dealer can't supply you send us money order or registered letter. No pay until paid.*



**ELECTRIC SOLDERING IRON CO., 137 W. 17th St., New York, N. Y.**

## Esico "Junior"

**BABY CALCULATOR**  
CHANGING & EASY TO USE



**SCREEN**

**ADDITION  
SUBTRACTION  
MULTIPLICATION  
DIVISION**

**VEST POCKET ADDING MACHINE**

Adds, subtracts, multiplies, divides. Does work of \$500 machine. Not a toy. Million dollar capacity. Strong and accurate. Guaranteed 5 years.

**FREE TRIAL \$2.50**  
—SEND NO MONEY—  
Total Cost

Just phone and address. We will ship Calculator immediately, the delivery our business. \$2.50 plus ten cents postage. If outside U. S. send cash. 20c additional in Postmaster's Case. If not satisfied after 10 days' trial you get your money back. **THIRTY-DAY OF ANY SATISFACTION.** Write for Agent Proprietor: **BABY CALCULATOR MACHINE CO.** (Mfrs.) P. O. Box 1218, Dept. 31, CHICAGO, ILLINOIS

**MEND**

**With METALOID**

The change never offered. Will fix with any metal that can be heated—aluminum, copper, tin, lead, selenium, grey and malleable iron. Repairs or restores with ease. Not affected by heat or cold water, gasoline or oil. Repairs 1000 brass, 250 tin, pressure gas-wrench. Size of 3 1/2 inch high, pointed in U. S. \$1.50; 4 1/2 inch high, \$2.00. A real money-maker for winter months.

**Agents:** Every house or business buys. Melrose Mfg. Co., 411 Egan Ave., Detroit, Mich.

**CYLINDER BLOCKS**

valve, intake, crank, piston, connecting rod, etc.

**\$1.00**  
PER PAIR

## WANTED: COUNTY MANAGERS

Reliable men to look after our repeat business and also demonstrate new fast-selling popular priced de ice. Opportunity for right men to earn \$350 to \$500 monthly. No investment in stock required. Opportunity to be one associated with one of the largest and fastest growing concerns of its kind in America. Write for full particulars and records of what others are earning.

**THE FYR-FYTER CO., 90-48 "F. F." Building, Dayton, Ohio**

## Get your own PATENTS

Inventors have legal right to file their own claims. Our book clearly explains step by step how to prepare all necessary papers. Eliminate chances of theft; avoid delay; deal directly with the Patent Office. Pay government fees only—Legal blanks and book of complete instructions, \$1.00. ("Making Patents Pay", \$1. "How To Get Your Own Copyrights, Trade-Marks, etc.", \$1. Any two books, \$1.75. All three, \$2.50.)

Address: **CUTTING & SONS, Dept. 110, Campbell, Calif.**

## CHROMIUM PLATING POWDER

**PLATES IRON, STEEL, NICKEL, BRASS AND COPPER** without electricity or machinery. Guaranteed not to tarnish; dispenses with polishing. Half pint can \$1.50, prepaid. Particulars **FREE.**

**GUNMETAL CO., Ave. T, Decatur, Illinois**

**CRESCENT**

**20" Band Saw**

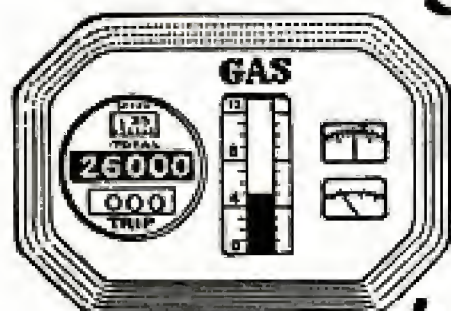
High grade, moderately priced band saw for home work; weighs 45 lbs. The pressure, convenience and accuracy of large band saw. Well balanced. 2 1/2" circular steel ground from light weight; or may be driven from live shaft. Machine finished table, with hardened work, size any angle to 45 degrees. Quick looking driver. Saw, with steel tension, is fully guided. We make wide line of hand saws, the various miter, wheels and accessories, also heavy machines for factories.

**THE CRESCENT MACHINE CO.**  
93 Columbia St. Leetonia, Ohio

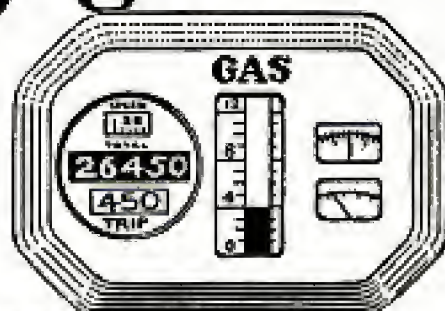
**Send for FREE BULLETINS**



# 450 MILES in a gallon of gas



*startling  
statement  
of famous  
Automotive Engineers*



How to increase gasoline mileage has been a problem that Automotive Engineers have been trying for years to solve. Recently a world famous engineer made the statement that the energy produced by burning a gallon of gasoline would run an auto a distance of 450 miles. Other well known authorities go on record as saying that eventually it may be possible to get over four times as much out of gasoline as in the past.

## Amazing Whirlwind Device Saving Millions of Gallons of Gas for Auto Owners

The Whirlwind Carbureting device embodies scientific features which conserves part of the gasoline that formerly went to waste.

Letters coming into the office tell of record mileages resulting in amazing gas savings. Low gasoline mileage is reported on practically every make of car. Greater power and smoother running motors are also noticed by users. The cost of the Whirlwind is so little that, basing its gas saving features even on the most modest reports, it would pay for itself almost immediately and then save many, many dollars for its owner by reducing gasoline consumption.

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

### FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

### SALESMEN and DISTRIBUTORS WANTED To Make Up To \$100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

**WHIRLWIND MANUFACTURING CO.**  
Dept. 776-A, Station C Milwaukee, Wis.

### GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

### FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,  
Dept. 776-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one free. This does not obligate me in any way whatever.

Name.....

Address.....

City.....State.....

( ) Check here if you are interested in full or part time salesman position.

When writing to advertisers please mention Popular Mechanics



## DISTRIBUTORS! SALESMEN!

## PYROIL

The Greatest  
Lubricating  
Development  
of all Time

Is Ready  
to Put a  
Fortune in  
Your Hands

## PYROIL HEADLINES!

What World Notables Say About PYROIL  
Russell Boardman, who used Pyroil on his world record-breaking flight from New York to Turkey, immediately tabbed back:

"Pyroil assemblage satisfactory, fuelless gas and oil consumption thereby reduced."

(Signed) "Boardman!"  
Tommy Estlick, famous title-holding motor boat racer who depends on Pyroil in every race, says:

"Was testing Pyroil on lake at Green Bay, W. I., Sept. 13, 1931, when motor got swamped with water, engine water—didn't like hitting ship's wall. I used it more Pyroil and raced it. When finally 'lost' motor apart from motor, ship still kept going from the wall, and I landed safely."

On Sept. 14, 1931, Estlick, using Pyroil, established new World record of 55,237 miles per hour (100 m.p.h.) at Middlebrook, Conn., and also won Eastern International Championship, 10000 "C". Also recently established new world records at Montreal, Mich. won 50000000 Championship in both 10000 and 50000 m.p.h. won Philadelphia Varsity Club Trophy at Philadelphia.

Major Manfred A. Pakes, Pelham, N. Y., noted Aviation expert, Analyst, Editor and Radio Broadcaster, says:

"After exhaustive tests using your product, I positively do recommend 'PYROIL' as being the last word in proper lubrication."

Dr. Arthur P. Little, Cambridge, Mass., awarded Perkins Medal as this year's "most distinguished American Chemist," says:

"There is nothing powerful which we should suspect would be injurious to a motor."  
A. B. MacLean, treasurer, Independent Coal Co., Burlington, Iowa, says:

"I have made a saving (using Pyroil) on my own mine (I trucked oil) approximately \$1.74 per day."

AND HERE ARE FURTHER RECENT TESTS OF PYROIL: PACIFIC GUANO & FERTILIZER CO., Analytical and Consulting Chemists, Honolulu, Hawaii. This test secured by Libby, McNeil and Libby of untreated and Pyroilized oil used in their trucks:

Pyroilized oil used twice as long as plain oil, burns twice as long as plain oil, and is better than any other material 50% petroleum in place oil, and is recommended.

UNIVERSITY OF UTAH TEST: (University test using oil with Pyroil, shows decrease of carbon 20%, as compared to oil without Pyroil, tested in comparison.)

Tests—Pyroil makes the "Indestructible" POSSIBLE!

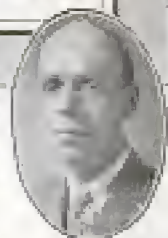
W. V. Kiddor, President

THE PYROIL COMPANY  
5121 Pyroil Building  
La Crosse, Wisconsin

POPULAR MECHANICS PRESS, PRINTED IN U. S. A.



Rich Territories Open Offering  
Up to \$200 and More Weekly Earn-  
ings—Year 'Round Tremendous  
Growing Businesses Established  
Daily.



General Agent for  
the United States  
and Canada  
W. V. Kiddor, President  
The Pyroil Company

The World Is Bowing to PYROIL, the Super-Lubricant!

Since its introduction, this never-before-equalled protector of motors has repeatedly amazed every user who has put it to the severest tests. Tests never before accomplished have been accomplished with PYROIL. Records of speed and endurance never before attained have been obtained with PYROIL.

## SOLVES EVERY FRICTION PROBLEM

PYROIL is positive protection against metal-to-metal wear and friction in motors. It is the proven solution to the greatest of all motor problems—a solution for which the entire engineering industry has waited for years!

## WHAT PYROIL DOES

PYROIL, simply added to oil and gas, establishes and permanently insures an all metal bearing surface, so that it never is contact an impermeable, friction-free, self-lubricating surface which is impervious to any degree of metal heat, is cold or under working stress of any kind. The microscopic lubricating film—which penetrates the pores of the metal to form a film—insulates the surface from the rubbing action of dust or particles for the duration, built-up, resists, lubricates for automobile, airplane, motor boat and all internal combustion engines!

## PYROIL POSITIVELY

Minimizes wear, reduces noise—and repair bills—on your engine—make things run smoothly.

## HERE'S OPPORTUNITY—TAKE IT!

You can establish yourself as an exclusive PYROIL Distributor or Representative. Clip the coupon below—fill it out and mail it. It will bring you the whole amazing story—good of PYROIL, its advantages, etc., also full complete details of this amazing opportunity for you. ACT AT ONCE!

## Beware of Imitations

Because PYROIL is manufactured under a highly controlled, patented process and is sold in sealed containers, it is impossible to counterfeit. It positively keeps the lubricated mechanism. It is 100% guaranteed!

## WINTER PYROIL

Pyroil "W" for winter use, establishes a permanent self-lubricating surface through an action of chemical, dilution and cold-weather action. It is the best of all. It keeps the engine warm when it is stopped and starts in cold weather. Buy several now for PYROIL "W".

## MAIL COUPON AT ONCE



Mr. W. V. Kiddor, Pres.,  
The Pyroil Company, 5121 Pyroil Bldg.,  
La Crosse, Wisconsin

Send me at once the amazing facts and good of PYROIL also complete Free Sales Plans and details of how Pyroil will establish me in a wonderful profit-making business of my own.

Name.....  
Address.....  
City..... State.....



# Start to Play Very First Day

This Year Give Yourself  
*Lifelong Fun*  
*Profit and*  
*Popularity*



## PARENTS!

What greater gift can you confer on your children this year than lifelong fun and entertainment?

Love of music means love of home, an appreciation of the finer things in life. Here is a chance to give your boy or girl that love without the tedious practice that most instruments require. The Xyloimba is easy to play. No teacher is needed. Practice is actually a joy.

Remember, the Xyloimba is the guaranteed product of a company established nearly half a century ago—a company that stands back of every promise it makes.

THINK of the best Christmas gift you have ever received. Multiply the pleasure it gave you by ten, and still you have only an idea of the joy you can give yourself this Christmas if you act at once.

## Start to Play the Very First Day!

Haven't you, like millions of others, envied the fellows who "bring down the house" with snappy xylophone or xyloimba numbers? Haven't you longed to create your own music, to be looked up to wherever you go, to be able to make real money in spare time? If you have, this ad spells O-p-p-o-r-t-u-n-i-t-y. The xyloimba—wonderful for home, in demand at dances and gatherings—is nevertheless the easiest of all instruments to play. In fact, on the very day you get yours you play simple melodies, even if you can't read a note of music right now. In a few weeks you astonish your friends and family. *All your life* you have the joy that comes to those who can entertain.

## Plays 20 Minutes; Gets \$20!

Ralph Smith, Chicago, played twenty minutes at wedding; his "pay" was \$20. Harry Brewer, New York, has made thousands of friends thru his xylophone selections on the radio.

L. E. Hallman, Reading, Pa., writes: "Made \$300 in 5 weeks—spare time."

And now J. C. Deagan, Inc. (world's largest manufacturer of xylophonic instruments) has made it so easy to own a xyloimba that nothing stands in your way. Sizes and styles to fit every age and pocketbook. A five-day free trial that eliminates risk. Free, easy lessons that make teacher unnecessary—and, best of all, such easy payments that they are hardly noticed.

## Will You Investigate?

Everyone wants to be popular. Everyone wants to make extra money. Everyone wants to be center of attraction at gatherings. But these advantages don't come by themselves. Opportunities must be seized. This is your opportunity—will you pass it up without investigation? The accompanying coupon will bring our big FREE book to your door. It tells all about the Deagan line, the free trial, the easy payments. Remember, no cost or obligation! Simply fill in and mail the coupon—but do it before it slips your mind. Today is as good a day as any. Do it NOW!

J. C. DEAGAN, Inc.  
Dept. 4459, 1770 Bertosa Avenue, Chicago

Please send me full details on the Free Trial offer and easy payment plan of the Deagan Xyloimba.

Name \_\_\_\_\_ Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

YOUR  
MAGIC

KEY

to Popularity

Mail  
Now!

Send for  
BIG FREE  
Book!



# NEW KIND of ROADLIGHT!



## TINY INVENTION NOW TURNS HEADLIGHTS INTO SEARCHLIGHTS -INSTANTLY!

At last! An invention that makes any headlight give at least twice the road illumination! Shoots an entirely new kind of "infused" light that banishes glare! So new and uncanny that it amazes everyone. Now offered for introductory test to all who mail the 10-DAY TRIAL COUPON promptly!



PERFECT-O-LITE astonishes expert and layman alike! Science at last has conquered the grief of night driving!

## DOUBLES ROADLIGHT.. BUT ENDS DIMMING!

IT is a well-known fact that motor car manufacturers have solved every big problem except one. As soon as the sun goes down at night, the highways of America break forth into a constant rushing stream of "dimming and dawning." Speed is cut down one-third to one-half. Every Monday morning finds the highways littered with broken glass, wrecks, cars in the ditch, overturned, shattered against telephone poles. Every man who ever groped dizzily down the highway in traffic at night knows the horrible sensation of being half-blinded by cars on his left, unable to see the ditch on his right, his own lights seeming dim and shadowy and practically worthless. Now, in a twinkling, this curse of night driving is lifted completely and inexpensively from the shoulders of the entire motoring world!

### Fits Any Headlight

This new lighting discovery is called Perfect-O-Lite. It is a little invention that replaces the ordinary "bulbs" in your automobile headlights. No extra wiring or installation. Millions of motorists have invested from \$10 to \$25 or more in so-called "Spot" Lights and "Driving" Lights which at best

are only makeshifts. This new lighting method costs only a tiny fraction as much, yet actually DOES double road illumination. Banishes need for Glare Shields. Cuts through the other fellow's light, yet absolutely cannot glare in his eyes. Makes rats, animals, children, detour signs, etc., visible at least three times as far. Now night driving at 40 to 60 miles an hour is safe and easy.

### Make Your Own Test Free

The secret of the amazing things this new light does is in the kind of "beam" or "ray" that it throws. Instead of ordinary light, this new invention pours a solid beam of double-reflected or "infused" light down the entire roadway. Shows up ditches at the side, as well as distant objects, absolutely clear. Space here limits further discussion of the facts about this discovery. Under an introductory offer you are now invited to be the judge without risking one penny. The coupon brings full details of the invention, offer of a set on FREE TEST and facts about agents' money-making opportunities. Mail it TO-DAY!

## PERFECT-O-LITE

HACHMEISTER-LIND CO.  
Dept. W-30 Pittsburgh, Pa.

### AGENTS! DAVIS MADE \$1400 IN ONE WEEK

Here actually is that chance for \$8 to \$14 your FIRST hour, \$6,000 to \$10,000 THIS year, with no limit WHAT-EVER for Distributors! Davis, Pa., made \$1,400 in one week! Fleet owners buy quantities. Bucks, W. Va., made \$236 in one order. Wallace & Tiernan, N. J., trucks just equipped. Blue and Gray Bus Line orders for fleet. Other big orders flooding in. Start full time or spare time. Use coupon for FREE TEST OFFER and get full details of Territory, etc. Guaranteed Sales Plan. Mail Coupon QUICK!



### HACHMEISTER-LIND CO., Dept. W-30, Pittsburgh, Pa.

Rush details of Free Test Offer, also facts about agents' money-making opportunities, without obligation.

Name .....

Address .....

City .....